NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

DOES THE METHOD OF INSTRUCTION AFFECT THE PERFORMANCE OF SAILORS IN THE TUITION ASSISTANCE PROGRAM?

by

Scott Woosley

June 2009

Thesis Advisor: Stephen Mehay
Co-Advisor: Elda Pema

THIS PAGE INTENTIONALLY LEFT BLANK

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.			
1. AGENCY USE ONLY ***(Leave blank)***	**2. REPORT DATE** June 2009	**3. REPORT TYPE AND DATES COVERED** Master's Thesis	
4. TITLE AND SUBTITLE Does the Method of Instruction Affect the Performance of Sailors in the Tuition assistance Program?		**5. FUNDING NUMBERS**	
6. AUTHOR(S) Scott Woosley			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000		**8. PERFORMING ORGANIZATION REPORT NUMBER**	
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A		**10. SPONSORING/MONITORING AGENCY REPORT NUMBER**	
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.			
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited		**12b. DISTRIBUTION CODE**	

13. ABSTRACT (maximum 200 words)

This study analyzes the impact of the Navy's Tuition Assistance (TA) program on the retention and performance of first-term navy enlisted personnel by method of instruction. This study is unique in that it estimates the effect of overall TA usage as well as the effect of courses delivered via Distance Learning (DL) versus courses delivered via traditional methods of instruction. In 2006 DL surpassed traditional classroom courses as the most commonly used form of TA. DL usage grew 1000% between FY 2000 and 2007 while traditional classroom usage dropped by 29%. This study utilizes a natural control group as proposed by Mehay and Pema (2009) to produce estimates that adjust for potential selection bias in the retention and performance models. Further, the study includes nine accession cohorts between 1994 and 2003 to increase the generalizability of the results. The recruits are tracked through their first four years of service. The analysis indicates that DL usage has greater positive effects on the performance of sailors than traditional classes. Additionally, the study finds that the course passing rates depend on the subject and method of delivery. In particular, certain courses delivered via DL are associated with lower passing rates for TA-users.

14. SUBJECT TERMS Tuition Assistance (TA) Program, retention, performance, Distance Learning (DL), method of instruction, passing rates			**15. NUMBER OF PAGES** 151
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	**18. SECURITY CLASSIFICATION OF THIS PAGE** Unclassified	**19. SECURITY CLASSIFICATION OF ABSTRACT** Unclassified	**20. LIMITATION OF ABSTRACT** UU

NSN 7540-01-280-5500 Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18

THIS PAGE INTENTIONALLY LEFT BLANK

Approved for public release; distribution is unlimited

DOES THE METHOD OF INSTRUCTION AFFECT THE PERFORMANCE OF SAILORS IN THE TUITION ASSISTANCE PROGRAM?

Scott A. Woosley
Lieutenant, United States Navy
B.H.S., Touro University International, 2003

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN MANPOWER SYSTEMS ANALYSIS

from the

NAVAL POSTGRADUATE SCHOOL
JUNE 2009

Author: Scott Woosley

Approved by: Stephen Mehay
Thesis Advisor

Elda Pema
Co-Advisor

Bill Gates
Dean, Graduate School of Business and Public Policy

THIS PAGE INTENTIONALLY LEFT BLANK

ABSTRACT

This study analyzes the impact of the Navy's Tuition Assistance (TA) program on the retention and performance of first-term navy enlisted personnel by method of instruction. This study is unique in that it estimates the effect of overall TA usage as well as the effect of courses delivered via Distance Learning (DL) versus courses delivered via traditional methods of instruction. In 2006 DL surpassed traditional classroom courses as the most commonly used form of TA. DL usage grew 1000% between FY 2000 and 2007 while traditional classroom usage dropped by 29%. This study utilizes a natural control group as proposed by Mehay and Pema (2009) to produce estimates that adjust for potential selection bias in the retention and performance models. Further, the study includes nine accession cohorts between 1994 and 2003 to increase the generalizability of the results. The recruits are tracked through their first four years of service. The analysis indicates that DL usage has greater positive effects on the performance of sailors than traditional classes. Additionally, the study finds that the course passing rates depend on the subject and method of delivery. In particular, certain courses delivered via DL are associated with lower passing rates for TA-users.

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF FIGURES

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF TABLES

THIS PAGE INTENTIONALLY LEFT BLANK

ACKNOWLEDGMENTS

I would like to acknowledge first and foremost all of the professors in the Manpower Curriculum who together provided a learning environment unique to the academic world and that is truly a service to their country. Special thanks to Professor Stephen Mehay and Professor Elda Pema whose depth of expertise and personal dedication were vital to the successful completion of this research.

I was fortunate to have the assistance and rapid responses of Cynthia Park for DMDC and Charles Giorlando for NETC in obtaining both invaluable data and insight into the databases that together were the basis for my research.

THIS PAGE INTENTIONALLY LEFT BLANK

I. INTRODUCTION

A. BACKGROUND

The Navy spent approximately 95 million dollars in FY 2006[1], up 23 million from the previous year, to fund voluntary education (VOLED) for nearly 70,000 of its sailors. The primary focus of this investment is to cultivate the career potential of its sailors by improving the four R's: Recruiting, Readiness, Retention, and Respect, and is summed up best by the mission statement for the Navy College Program (NCP).

> The NCP signals the Navy's commitment to education by improving enlistment appeal, demonstrating Navy service and achieving a college degree are compatible, helping Sailors apply themselves to new situations and challenges and better preparing them for advancement, building up Sailors' self-image, and producing higher quality Sailors…[2]

The largest component of the VOLED program is undergraduate Tuition Assistance (TA) and will be the focus of this study. In FY 2006, nearly 51,400 recruits took about 209,000 classes via TA. The effect of TA on the careers of participants has been studied by the Center for Naval Analysis (CNA), the RAND Corporation, and the Naval Postgraduate School. However, none of the previous studies investigates the different effects of TA by method of

1 Voluntary Education Fact Sheet, ed. Defense Activity for NonTraditional Education Support, 2006, <http://www.dantes.doded.mil/Dantes_Web/library/docs/voledfacts/FY06.pdf.

2 "Navy College Program," Mission Statement, ed. VOLED Detachment, Center for Personal and Professional Development, <https://www.navycollege.navy.mil/about.htm>.

instruction. This study fills the void in the literature and provides timely policy prescriptions, in light of the recent growth in DL courses. In FY 2006 Distance Learning (DL) became the most commonly used method of instruction for undergraduate TA-users. Table 1 shows that DL usage has grown by 1000% since FY 2000 while traditional classroom usage has fallen by 29%. This significant shift may have been brought about by the increase in operational tempo since the events of 9/11, requiring deployment of increased numbers of sailors to locations without access to traditional classrooms. The shift from traditional methods of instruction to DL may affect the impact of TA on the retention and performance of enlisted sailors.

Table 1. Active Duty Enlisted Undergraduate TA Participation Rates

Active Duty Enlisted Undergraduate TA Usage			
FY	Overall	Traditional	DL
1995	102712	102668	44
1996	90129	90060	69
1997	93578	92397	1181
1998	100363	96838	3525
1999	101241	95509	5732
2000	105571	97355	8216
2001	106888	94550	12338
2002	112002	91980	20022
2003	112971	82756	30215
2004	131483	84161	47322
2005	143021	82767	60254
2006	153731	78569	75162
2007	151334	68953	82381
Number of courses taken			
Source: NETC data			

B. RESEARCH QUESTIONS

The primary research questions addressed by this thesis are:

- Do TA-users have higher promotion and retention than non-users?
- Does this effect depend on whether they take distance learning or traditional classes?
- Do passing rates vary between distance education and traditional classes?

The secondary research question for this thesis is:

- Does the course subject affect the passing rates of distance and traditional classes?

C. ORGANIZATION OF THE STUDY

Chapter II reviews prior studies on the effects of TA usage on retention and performance of sailors and the expected effect of general education on worker mobility based on human capital theory. It also reviews the rapid growth of DL and the differences in student characteristics based on method of delivery.

Chapter III provides descriptive statistics of the TA data by rank, gender, race/ethnicity and course type based on data files provided by the Naval Education and Training Command (NETC) and the Defense Manpower Data Center (DMDC). The files contain information on TA usage at the course level and demographic data for new Navy accessions from the enlisted master file.

Chapter IV describes the development of the multivariate models used to determine the causal effect of TA on retention and reenlistment. Models were developed to

estimate the effects of overall, traditional, and DL TA-usage on retention and performance of enlisted sailors. Additionally, a separate model was developed to estimate the effects of DL and course type on passing rates. The results of the multivariate models are discussed in Chapter V.

Chapter VI provides a summary of the effects of TA-usage, by method of delivery, answers to the research questions posed above, recommendations, and areas of future research.

II. LITERATURE REVIEW

A. WHY FIRMS PAY FOR GENERAL EDUCATION

This section provides a literature review and discussion in three primary areas: Incentives for firms to pay for the post-secondary education of their employees; previous studies on the effects of general education on first term sailors; and the rapid growth of Distance Learning (DL) and differences in student characteristics between DL and traditional classes.

According to human capital theory, the military, like other large firms, has little incentive to invest in general education for recruits. Such programs increase an employee's marketability with skills that are fully transferable to other firms. In order for the military to reap the benefits of their investment, the recruit would have to remain in the military. However, accumulation of general (and, therefore, transferable) human capital increases job opportunities elsewhere for the employee, thus potentially increasing the probability that he will leave for another job before the military recoups its investment in human capital.[3]

Contrary to the predictions of human capital theory an estimated 79% of large firms pay some or all of the cost of post-secondary education for employees.[4,5,6] Four prevailing

3 R.G. Ehrenberg, and R. S. Smith, 2008. Modern Labor Economics 10th Ed. Pearson Addison Wesley.

4 P. Capelli, 2004. Why Do Employers Pay for College? Journal of Econometrics, 121: 213-241.

5 C. Flaherty, 2007. The Effect of Tuition Reimbursement on Turnover: A Case Study Analysis. Working Paper 12975. Cambridge, MA: National Bureau of Economics Research.

arguments as to why firms provide general education are offered by economists. The first theory hypothesizes that post-secondary (general) education is a fringe benefit that enhances the bond between employees and the firm. As a result workers remain with the firm allowing the firm to earn a return on its firm-specific training investments.[7] Firm-specific training is of value only to the providing firm and does not increase the employee's marketability. Due to the inherent differences in employees and their value systems the actual worth of the benefit can vary between employees. The second hypothesis is that general education complements firm-specific training, thus increasing the productivity of employees more in the current firm than other firms. Therefore, the benefit to the employee of staying with the current employer exceeds the gains that would be made by leaving the firm.[8] Another theory argues that general training may not necessarily lead to turnover if firms have monopsony power due to costly worker mobility.[9,10] A final hypothesis suggests that educational benefits may attract higher-quality applicants than other non-wage benefits.[11]

---

[6] Bureau of Labor Statistics, 2007. The National Compensation Survey: Employee Benefits in Private Industry in the U.S., March 2007.

[7] H.A. Glick, and M.J. Feuer, 1984. Employer-sponsored training and the governance of specific human capital investments, *Quarterly Review of Economics and Business*, 24(2), 91-103.

[8] C. Flaherty, 2007.

[9] D. Acemoglu, and J. Pischke, 1999. Beyond Becker: Training in Imperfect Labour Markets. *The Economic Journal*, 109(2), F112-F142.

[10] D. Autor, 2001. Why do Temporary Help Firms Provide General Skills Training? *Quarterly Journal of Economics*, 116(4), 1,409-1,448.

[11] P. Capelli, 2004. Why do employers pay for college? Journal of Econometrics, 121, 2, 113-2,241.

The Navy provides both firm specific and general education to sailors. All of the above-mentioned theories may apply to Navy personnel. While human capital theory predicts that it is not efficient to provide general training, other alternative theories suggest that such training may increase retention through a variety of channels. The next section reviews evidence on the effect of TA on retention in the Navy.

B. PREVIOUS STUDIES ON THE RETENTION EFFECTS OF GENERAL EDUCATION ON FIRST TERM SAILORS

Four main studies have been conducted on the Navy's Tuition Assistance (TA) program. Garcia and Joy (1998), on behalf of the Center for Naval Analysis, undertook the first study. Garcia and Joy attempted to analyze differences in both the performance and retention of sailors who participated in the TA program. Promotion and demotion were the primary means of measuring performance of sailors and reenlistment was the key indicator for retention. Garcia and Joy found that TA had a significant positive relationship on both promotion to E-5 and retention. One shortcoming of this study was that it did not adjust the estimates for selection bias. Since TA participation is voluntary, it is likely that TA-users have potentially different ability and motivation than non-TA users.[12] Additionally, the empirical analysis in the study used only one cohort of new Navy enlistees, which may not be representative.

[12] F. Garcia, and E. Joy, 1998. Effectiveness of the Voluntary Education Program. Alexandria, VA: Center for Naval Analyses.

A second study by Garcia, Arkes, and Trost (2002) estimated that participation in the Navy's TA program increased the probability of continuing in the Navy for six years by 12.9 percentage points. To control for potential bias created from self-selection, the authors used an instrumental variable (IV). The IV was based on sailors who received educational counseling, with the hypothesis that more informed sailors would be more likely to participate in VOLED. They concluded that the increase in retention would result in monetary savings to the Navy (in terms of reduced retention bonuses) that exceeded the cost of the TA program.[13]

Contrary to the first two studies, Buddin and Kapur (2005) found a negative correlation between TA program use and retention, even though they used the same data as the previous two studies. The study criticized the IVs used, since the unobserved heterogeneity that drives TA participation would be similar to that which drives sailors to attend educational counseling. Buddin and Kapur based their results on estimates obtained from both bivariate probit and propensity score matching (PSM) techniques.[14] Proximity to a four-year college, base size, base educational offerings, and an interaction between the last two were used as IV's for the bivariate probit model. Although Buddin and Kapur used different IVs they are arguably weak. In particular proximity to a four-year

[13] F. Garcia, J. Arkes, and T. Trost, 2002. Does employer-financed general training pay? Evidence from the U.S. Navy. *Economics of Education Review*, 21, 19-27.

[14] R. Buddin, and K. Kapur, 2005. The effect of employer-sponsored education on job mobility: Evidence from the US Navy. Industrial Relations, 44(2) (page numbers)

college was used as “taste for college”, however, Card(1993) argues that the importance of the variable lies in its correlation to lower college costs.[15] For individuals who have already joined the military, it is not clear that proximity to college before enlisting would work via the same channels as in the civilian world. This because the cost of attending college, taste for education, and taste for the military all interact when making the decision to enlist.

Another explanation for the differences in results in these studies hinges on how the analysis treats the cohort members who leave the military early.[16] Buddin and Kapur restrict the sample by removing service members who leave the military (attrite) before they complete their first contract. Their justification is that these sailors do not have the same opportunity to use TA as those who complete their initial contracts. This key difference in specification appears to account for much of the difference in findings.

Unlike the prior three studies, two recent studies by Mehay and Pema (2008, 2009) employ a multi-cohort dataset and a natural control group approach to estimate the effects of educational assistance programs on both retention and productivity of Navy enlisted personnel. Using multiple cohorts instead of a single cohort improves the

[15] D. Card, 1993. Using Geographic Variation in College Proximity to Estimate the Return to Schooling. Princeton University: Industrial Relations section, Working Paper No. 317.

[16] S. Mehay, and E. Pema, 2009. The Effect of Employer-Sponsored General Education on Turnover and Productivity: New Evidence from Military Tuition Assistance Programs. Monterey, CA: Naval Postgraduate School, Graduate School of Business and Public Policy.

generalizability of their results. To address the potential self-selection of TA users based on motivation and ability, the study exploits random variation in course completion among TA users. Some sailors enrolling in TA courses are unable to complete their classes due to unplanned deployments, transfers, emergencies and medical issues. By enrolling in TA courses, these sailors have revealed their propensity and motivation to use the TA program, but were unable to complete the courses due to exogenous factors. They provide a natural control group with similar motivation and propensities towards educational assistance as those who signed up for TA and who completed their courses.[17]

Additional concerns of the first studies cited by Mehay and Pema are centered on the use of the 1992 cohort. The 1992 cohort enlisted shortly after the 1990-1991 recession with high unemployment rates and their initial contracts expired in 1997-1998 coinciding with the dot-com boom with historically low unemployment rates. Together these factors could be the reason why the overall retention rate in the 1992 cohort was extraordinarily low at approximately 30%.

C. RAPID GROWTH OF DISTANCE LEARNING

Previous studies on TA users have focused on TA's overall effect on retention and performance, but do not discuss differences by method of instruction. Distance Learning (DL) surpassed the traditional classroom setting as the dominant method of instruction in the Navy in 2006. The

[17] S. Mehay, and E. Pema, 2009.

following sections focus on the rise of DL in civilian and military settings as well as key differences between DL and traditional students.

Civilian studies find that since the mid 1990s DL has been rapidly growing as an instrument for providing education opportunities. During the fall term of 2006 almost 3.5 million students were taking at least one online course, representing a 9.7% increase over the number reported the previous year. This growth rate in online enrollments greatly exceeds the 1.5% growth in overall higher education student enrollments.[18,19]

The greatest growth has been among 2-year degree granting institutions with four-year bachelor's programs showing the slowest growth. The Navy's current policy does not clearly segregate its TA usage by institution type, but does so by traditional freshman through senior categories. Undergraduate education comprises the largest subsection of Navy TA usage (the other categories include high school skills, developmental courses, vocational training, advanced degrees, and continuing education units).

D. FUTURE GROWTH OF DISTANCE LEARNING

Civilian educators believe that the period of 20% to 30% annual growth in online learning is coming to an end. The institutions that deliver 75% of the online education comprise about one-third of all higher education

[18] E. Allen, and J. Seaman, 2007. Online Nation, Five Years of Growth in Online Learning. *The Sloan Consortium.*

[19] P. Beffa-Negrini, B. Miller, and N. Cohen, 2002. Factors Related to Success and Satisfaction in Online Learning, *Academic Exchange*, Fall, 105-114.

institutions. Although it appears that many more institutions could begin to offer or expand their DL offerings, speculation is that the educational institutions that are going to provide online learning are already doing so. Any large future growth is likely to come from current online providers who expand into new online programs for their students. Although most analysts predict that the rapid growth of DL is coming to an end, 69% of school administrators believe that student demand for DL will continue to grow for many years.[20]

E. BARRIERS TO WIDESPREAD ADOPTION OF ONLINE EDUCATION

Some critics argue that schools are looking to make easy money when they provide DL courses. However, leading DL schools say that the goal of offering DL courses is not to increase profit margins, but rather an opportunity to expand their student base and provide more flexible avenues with which to deliver course material. Key barriers to schools implementing effective DL programs include the following: low faculty acceptance; perceived discipline deficiencies of students; and the high costs of developing DL courses.

Low faculty acceptance occurs from the belief by some professors, that DL is not a valid method of instruction, primarily due to the lack of face-to-face interaction between professor and student. Low faculty acceptance of DL as a trusted educational tool can slow development of programs and subsequently hamper effective gains in corporate DL knowledge. This further reinforces traditional

[20] E. Allen, and J. Seaman, 2007.

faculty members' lack of acceptance of DL. In 2006, 41% of higher learning institutions either were not interested or not strategic about their implementation of DL. Less than 8% of these schools report that their faculty accept the legitimacy of DL as comparable to classroom courses, whereas schools that consider themselves "fully engaged" have acceptance levels of over 60%. Student interaction with the professor is listed among the strongest predictors of student success. Thus, low faculty acceptance of DL validity may adversely affect a school's completion rate.[21]

Some educators believe student discipline must be increased before DL can truly take off. Both civilian and military institutions have observed apparent lower completion rates for DL courses versus traditional classroom courses. Most studies show that students who take DL courses are older than traditional classroom students, but age does not appear to significantly affect completion rates. DL students also tend to be career-oriented and often choose DL courses (instead of traditional classroom courses) due to their strenuous work demands.[22,23] The priority given to work demands may provide a better explanation for low completion rates than lack of discipline. With funding often tied to passing and

[21] S. Howell, D. Laws, N. Lindsay, 2004. Reevaluating Course Completion in Distance Education, Avoiding the Comparison Between Apples and Oranges. *The Quarterly Review of Distance Education*, 5(4), 243-252.

[22] E. Allen, and J. Seaman, 2007.

[23] J. Dutton, M. Dutton, and J. Perry, 2002. How do Online Students Differ from Lecture Students? *Journal of Asynchronous Learning Networks*, 6(1), 1-20.

completion rates, lower passing rates could prove to be a large barrier for schools with new or developing DL programs.

F. DIFFERENCES IN STUDENT CHARACTERISTICS

Some researchers say that a direct comparison of traditional students to DL students is not useful due to the inherent differences between the two groups. These differences exist in terms of both observable characteristics and the students perceived needs. The online student tends to be older and more career-oriented with fewer ties to traditional degree programs.

A study published in 2002 compared the performance and characteristics of traditional and DL students enrolled in nearly identical courses. The study found that the online students were over five years older than their traditional counterparts.[24] This finding is commonly cited in the DL literature.[25,26] Although the average age tends to be higher for DL students it was not found to be a statistically significant factor in predicting final exam scores. Figure 1 shows the differences in type of course (DL vs. lecture) by age category.

[24] J. Dutton, M. Dutton, and J. Perry, 2002.

[25] S. Carr, 2000. As Distance Education Comes of Age, the Challenge Is Keeping the Students. *Chronicle of Higher Education*, v46 n23 pA39-A41.

[26] S. Howell, D. Laws, and N. Lindsay, 2004.

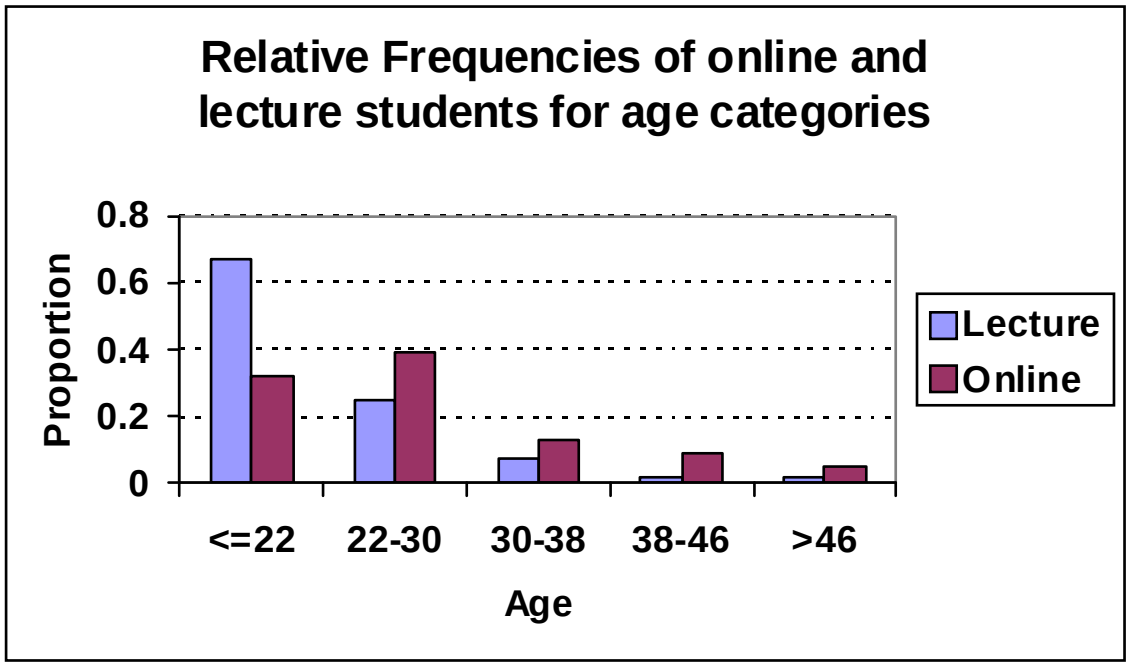

Figure 1. Relative Frequencies of online and lecture students for age categories. Source: Dutton, J., Dutton, M., and Perry, J. (2002).

The single largest negative factor in predicting student performance was work schedule. This finding appears regularly in research on both persistence and performance of DL students.[27] As with differences in age, DL students are generally characterized as more career-oriented. Dutton, Dutton, and Perry (2002) study found that 84.3% of the DL students expected to work during the upcoming quarter, whereas only 54.8% of traditional students made a similar claim. Not only were DL students more likely to work during their classes than traditional students, most expected to work almost twice as many hours. The demands of life commitments, such as children and work also account for some of the differences in completion rates between DL and

[27] W. Kemp, 2002. Persistence of Adult Learners in Distance Education. *The American Journal of Distance Education,* 16(2) 65-81.

traditional students, as well as being the most commonly-cited frustration for DL students.[28] Both children and work demands are listed in the 1999 U.S. Department of Education's findings about the seven situational factors which play a significant role in whether students will persist in college. Dutton, Dutton, and Perry's 2002 and 2005 studies found work commitments to be statistically significant in predicting final test scores, whereas childcare was not significant. Further support for claims that DL students are career-oriented comes from their significantly lower enrollments in traditional programs. Only 50% of DL student enrollments were in traditional four-year programs, whereas 85% of traditional students participated in four-year programs. This finding leads some researchers to believe that online learners link personal and career benefits to specific courses versus advantages gained through participation in traditional programs.

G. PERFORMANCE

Differences between DL and traditional students are also observed in performance and course completion rates. Performance has been measured by test scores and willingness of employers to hire new employees with DL degrees. Differences in completion rates have been widely discussed and researched, with some claiming lower completion rates for DL students while others warning of the complications in trying to compare apples to oranges.

[28] P. Borstorff, and S. Lowe, 2007. Student Perceptions and Opinions Toward E-Learning in the College Environment. *Academy of Educational Leadership Journal*, 11(2).

Although not everyone believes that DL degrees are as valid as traditional degrees, the bulk of studies show that DL students do as well or better at the course level in learning outcomes.[29] Dutton and Dutton find that final exam scores were 7 points higher for DL than for traditional students, all other factors held constant.[30] However, Thomas Russell published an annotated bibliography entitled *The No Significant Difference Phenomenon,* in which he lists hundreds of sources that find little or no differences in performance between DL and traditional students.

Common criticism of these findings, however, comes in two forms. The first is that much of the research does not control for extraneous factors and/or does not use randomly selected subjects. These critics contend that casual implications cannot be drawn due to the missing extraneous variables, and due to the self-selection bias created by systematic differences between students who opt to take DL versus traditional courses. The second criticism is that comparing traditional and DL students on the basis of course success may be misleading. Researchers who believe course results may not properly represent the end product contend that further research into the effects of DL programs versus traditional programs should be conducted before claims of success are made. Students who complete primarily DL courses may be a different product for the workplace than

[29] R. Phipps, and J. Merisotis, 1999. What's the Difference, A review of Contemporary Research on the Effectiveness of Distance Learning in Higher Education. *The Institute for Higher Education Policy.*

[30] J. Dutton, M. Dutton, and J. Perry, 2002.

traditional students.[31] However, evidence shows that academic leaders do not believe that there is a lack of acceptance by employers for online degrees.

H. COMPLETION RATES

In general, research shows that completion rates for DL students are lower than those of traditional students. The number varies wildly by study and institution. Controversy over actual completion rates for DL students stems from how institutions define completion rates and whether we should be comparing such rates at all.

In the study *Avoiding the Comparison Between Apples and Oranges* the authors review studies showing that DL completion rates range as low as 40% to over 80%.[32] A 2003 study found that 66% of distance learning institutions had better than 80% completion rates and 87% of institutions had better than 70% completion rates.[33]

Many of the differences found in completion rates may stem from how they are calculated, from differences in student characteristics, and from limitations of the data that is available to researchers. There seems to be no clear definition of who a non-completer is. A study conducted by Kemp (YEAR) defines non-completers as those who signed up for a course and either did not complete the course or received a failing grade. Non-completers included students who dropped the course within the official no

[31] R. Phipps, and J. Merisotis, 1999.

[32] S. Howell, D. Laws, and N. Lindsay, 2004.

[33] D. Brigham, 2003. Benchmark Information Survey. Unpublished presentation, Excelsior University.

penalty drop period. This definition resulted in an overall course completion rate of 36%. However, if students who dropped the course later and those who never submitted a single assignment (non-starters) are removed, the completion rate jumps to 97%. Once non-starters were removed in studies of similar courses completion rates were over 90%.[34]

As with many civilian studies comparing completion rates excluding non-starters will be difficult for the military as limitations of the data may preclude detailed comparisons. Further complications arise in comparing completion rates due to differences in student characteristics.[35] Life demands may greatly affect the non-starter population, as priority for work demands may make education at best a second priority. This comparison may be similar to comparing passing rates of deployed military personnel to those with stable shore duty commitments. Without controlling for extraneous factors and self-selection bias, the comparisons provide a murky picture at best.

I. STUDENT SATISFACTION

Finally, student satisfaction plays a role in the performance and commitment of students. Several studies have shown that although students show a slight preference for a traditional education setting, DL does not statistically diminish student satisfaction as compared to face-to-face methods.[36,37] Based on traditional views, the

[34] W. Kemp, 2002.

[35] S. Howell, D. Laws, and N. Lindsay, 2004.

[36] P. Beffa-Negrini, P., Miller, B., and Cohen, N. (2002).

richer the delivery media, the more satisfaction and success will be achieved. However, a meta-analysis conducted in 2002 provides evidence that richer media may not lead to more effective instruction for DL courses. Although the amount and ease of communication greatly impacted satisfaction, the richness of the media, such as video teleconferencing versus email did not significantly affect student satisfaction. The study further implies that a switch from face-to-face education to DL should not result in decreased student satisfaction, and should not interfere with success rates.[38]

Based on previous studies, student satisfaction is not considered to be significantly different between DL and traditional students. With satisfaction set aside, specification of the control group, inclusion of extraneous control variables, and a methodological approach that controls for potential selection bias will be key in measuring differences in the performance between DL and traditional students.

[37] P. Borstorff, and S. Lowe, 2007.

[38] M. Allen, J. Bourhis, N. Burrell, and E. Mabry, 2002. Comparing Student Satisfaction With Distance Education to Traditional Classrooms in Higher Education: A Meta-Analysis. *The American Journal of Distance Education,* 16(2) 83-97

III. TUITION ASSISTANCE & DISTANCE LEARNING DATA

A. INTRODUCTION

To lay the foundation for development of the multivariate models, this chapter will discuss the data set obtained from the NETC training command. Special emphasis will be given to key factors in understanding the growth and distribution of DL in reference to overall and traditional TA use from FYs 1995-2008. The chapter will begin with an overview of total usage in courses and participation. The sections that follow will describe differences in TA usage by rank, gender, and race. To conclude, the chapter will discuss usage and passing rates for aggregated course types, providing a picture of key differences in distribution of courses between DL and traditional TA.

B. OVERALL TA USE

The NETC data originates from the Navy College Management Information System (NCMIS) data base with 1,960,592 individual TA funded courses for all active duty Navy personnel from FY 1995-2008. For this study the sample is restricted to enlisted personnel taking undergraduate courses only, leaving 1,641,740 observations. Hereafter, TA usage will refer to the use of tuition assistance by active duty enlisted sailors taking undergraduate courses. Additionally, variables and categories covering traditional methods of instruction (classroom setting) will be referred to as non-DL for brevity in the data analysis and

multivariate models. For simplicity, this study will assume that DL instruction is interchangeable with traditional instruction.

As seen in Figure 2 overall TA usage grew steadily from FY 1996 to FY 2003, but increased sharply from FY 2003 to FY 2006. However, this sharp increase is mostly due to of DL's rapid growth in the Navy's TA program. The values for all figures in this chapter are found in Appendixes A-K.

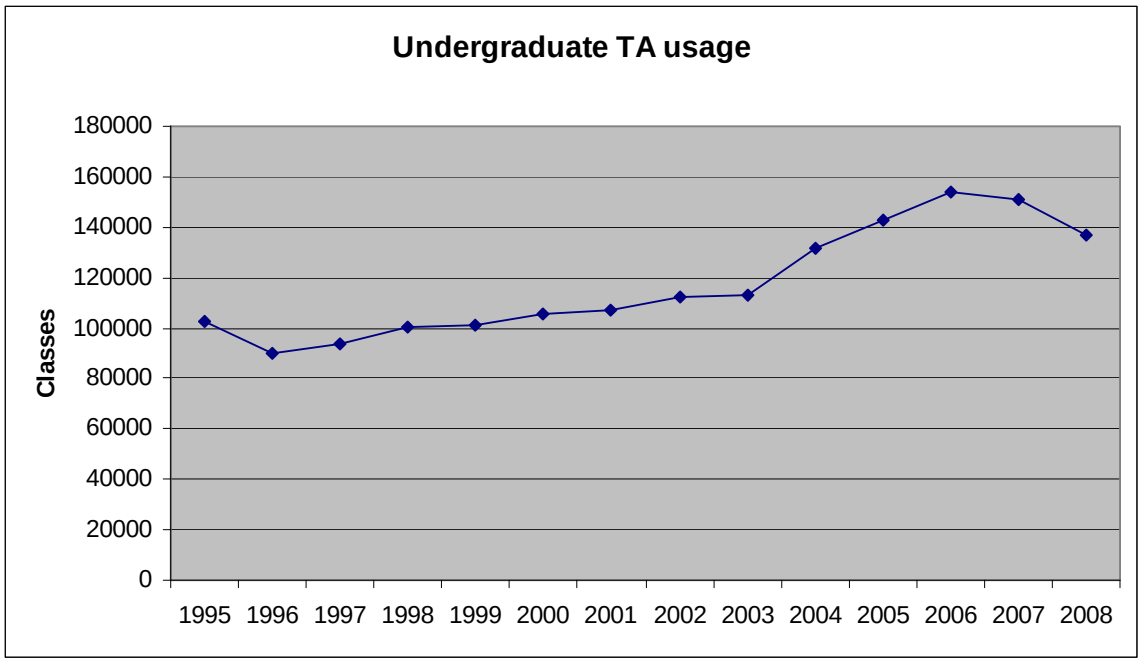

Figure 2. Undergraduate TA usage per Fiscal Year. Source: NCMIS

In FY 1995 DL accounted for only 44 classes but rapidly grew to 82,381 for FY 2007. In the same period of time traditional courses dropped from their highest point of 102,668 (FY 1995) to their lowest 68,953 (FY 2007). DL surpassed traditional courses in both total courses taken and number of participants in FY 2006 as seen in Figure 3.

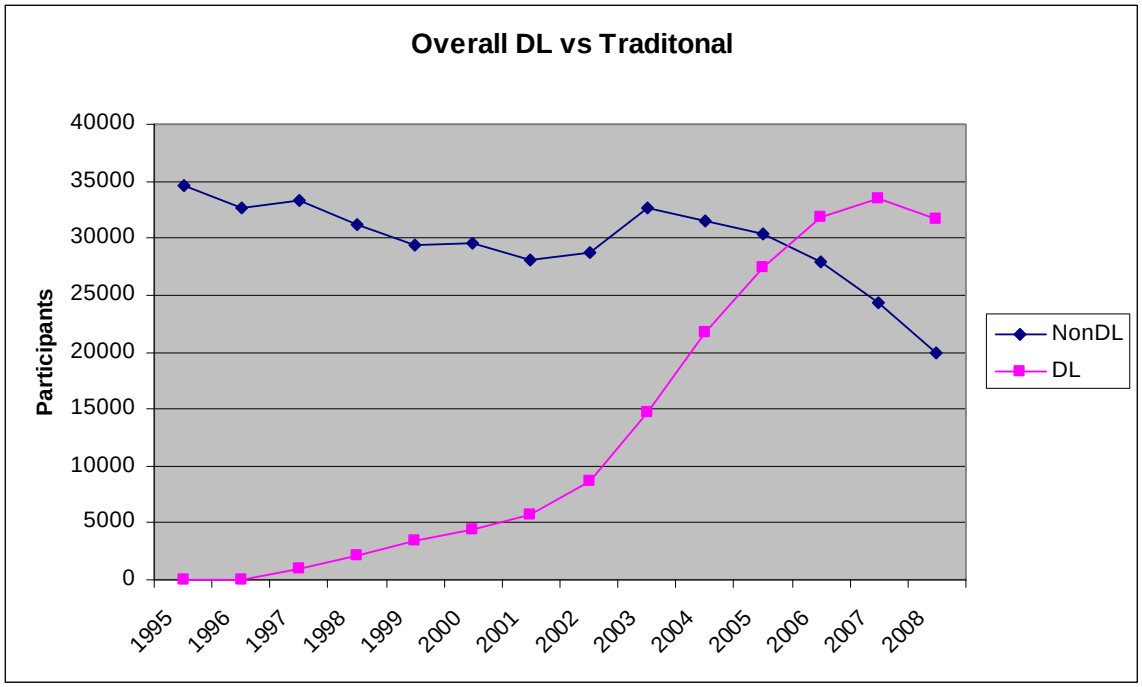

Figure 3. DL vs. Traditional usage per year. Source: NCMIS data

During FY 2000 to FY 2007 DL usage swelled by nearly 1000% while traditional usage fell by 29%. In FY 2008 DL was used for nearly 60% of classes taken by active duty enlisted sailors. On average traditional students took 3 classes per year while DL students averaged only 2 classes per year. This may partially be explained by low DL usage in early years as the gap between average courses taken via DL and non-DL methods has steadily decreased over the past decade. One theory suggests that DL students are not tied to degree-granting programs at the same extent as traditional students, who are required to take courses as part of program requirements and electives.[39] Therefore, DL students may pick and choose courses based on the benefits

[39] P. Borstorff, and S. Lowe, 2007.

gained by specific classes rather than degree requirements, reducing the number of classes DL students take on average.

Table 2. Average Number of Courses Taken by Students Per Fiscal Year

Average number of Courses Taken by Students by Fiscal Year			
FY	Overall	Non-DL	DL
1995	2.97	2.97	1.38
1996	2.76	2.76	1.68
1997	2.77	2.77	1.28
1998	3.12	3.11	1.63
1999	3.26	3.25	1.70
2000	3.32	3.29	1.86
2001	3.32	3.37	2.17
2002	3.28	3.19	2.33
2003	2.61	2.54	2.05
2004	2.73	2.66	2.17
2005	2.75	2.73	2.20
2006	2.89	2.81	2.36
2007	2.94	2.83	2.46
2008	2.98	2.83	2.54

The number of classes per person overall has remained reasonably stable (2.61-3.32) and the number of TA participants has grown nearly every year during FY 1995-FY 2007. However, the overall active duty enlisted numbers have dropped by approximately 100,100 sailors. Despite this drop, participation rates have continued to rise as shown in Figure 4 and spiked considerably from FY 2003 (10.6%) to FY 2007 (18%). DL rates grew from 4.6% to 11.7% in the same period with traditional course rates fluctuating slightly as shown in Figure 5.

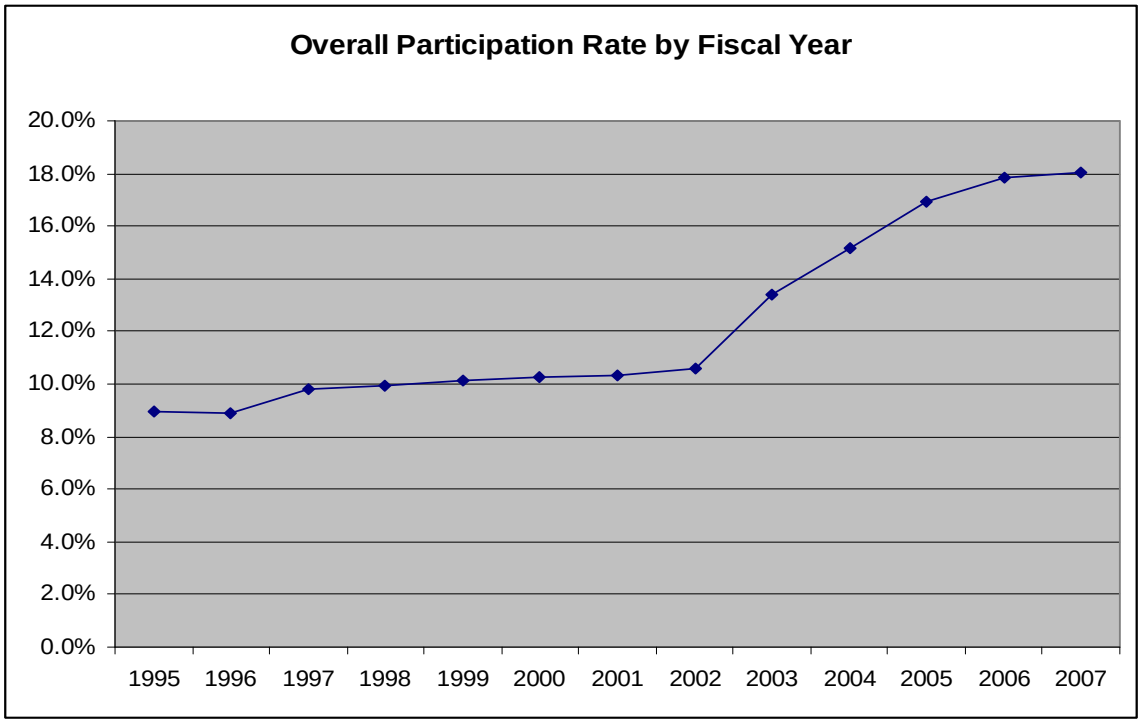

Figure 4. Overall TA Participation rate by Fiscal Year
Source: NCMIS

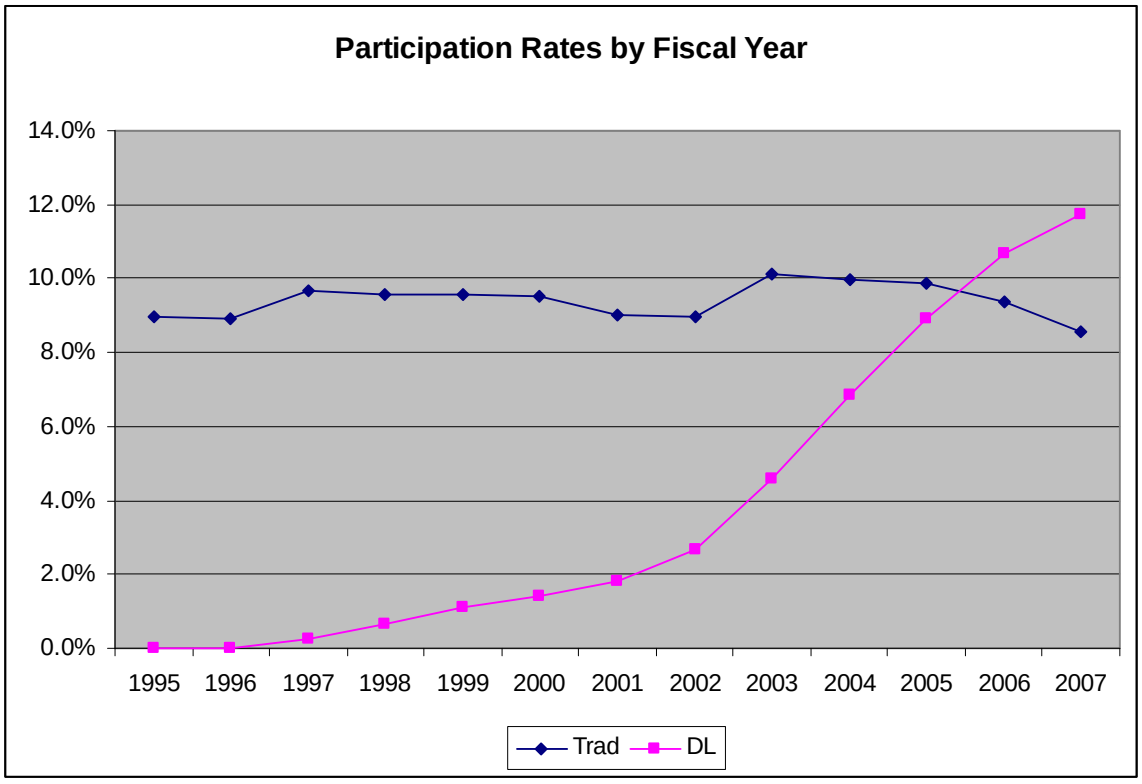

Figure 5. DL and Traditional Participation Rates by Fiscal Year Source: NCMIS

C. DIFFERENCES IN TA USAGE BASED ON RANK

Navy active duty enlisted numbers have decreased since FY 1995, but reductions were not evenly distributed across paygrades as seen in Figure 6. Entry ranks E-1 & E-2 saw the most significant decreases averaging 43% while E-3's experienced the lowest cuts at 10.6%. This may have resulted from Navy policies intended to retain experienced individuals through numerous reductions in force size over the past decade.

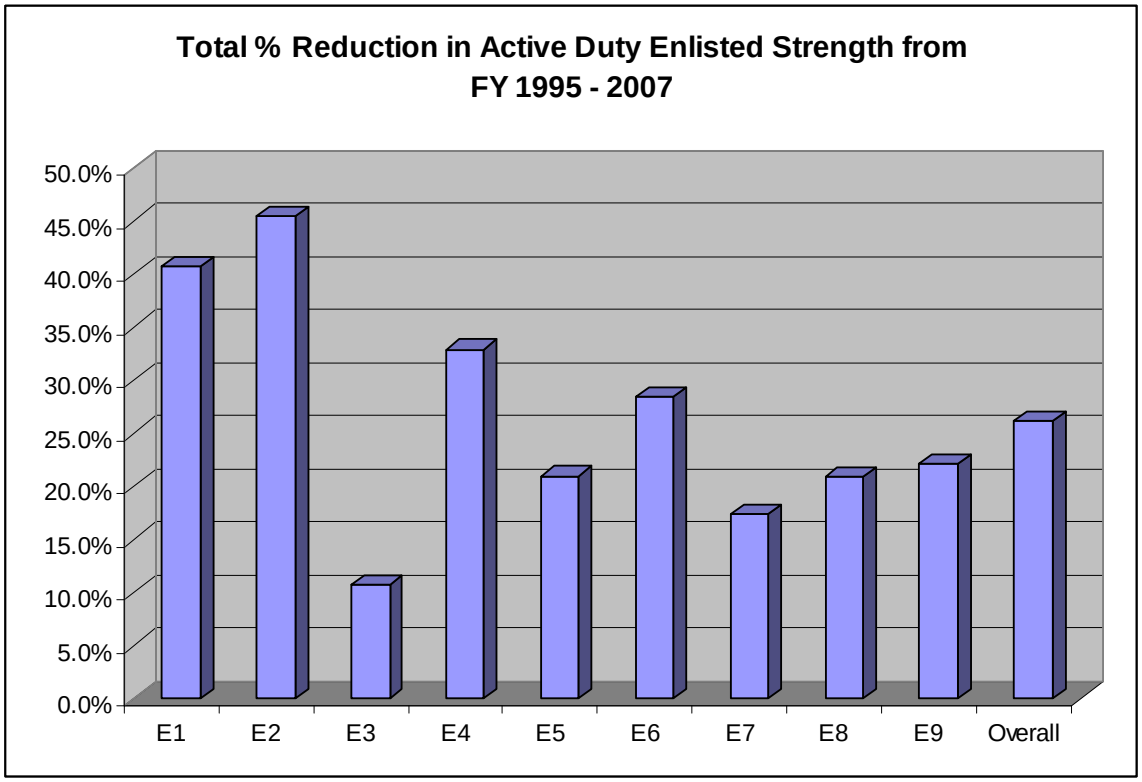

Figure 6. Total Percent Reduction in Active Duty Enlisted Strength from FY 1995-2007: Source DMDC

Figures 7 and 8 depict the TA usage rates by enlisted rank for years 1995-2007. During this period, TA usage has dropped by a total of 7% in paygrades E4 and below from FY 1995 to 2007. However, TA usage rates for middle managers (E-5 to E-6) grew by 5%.

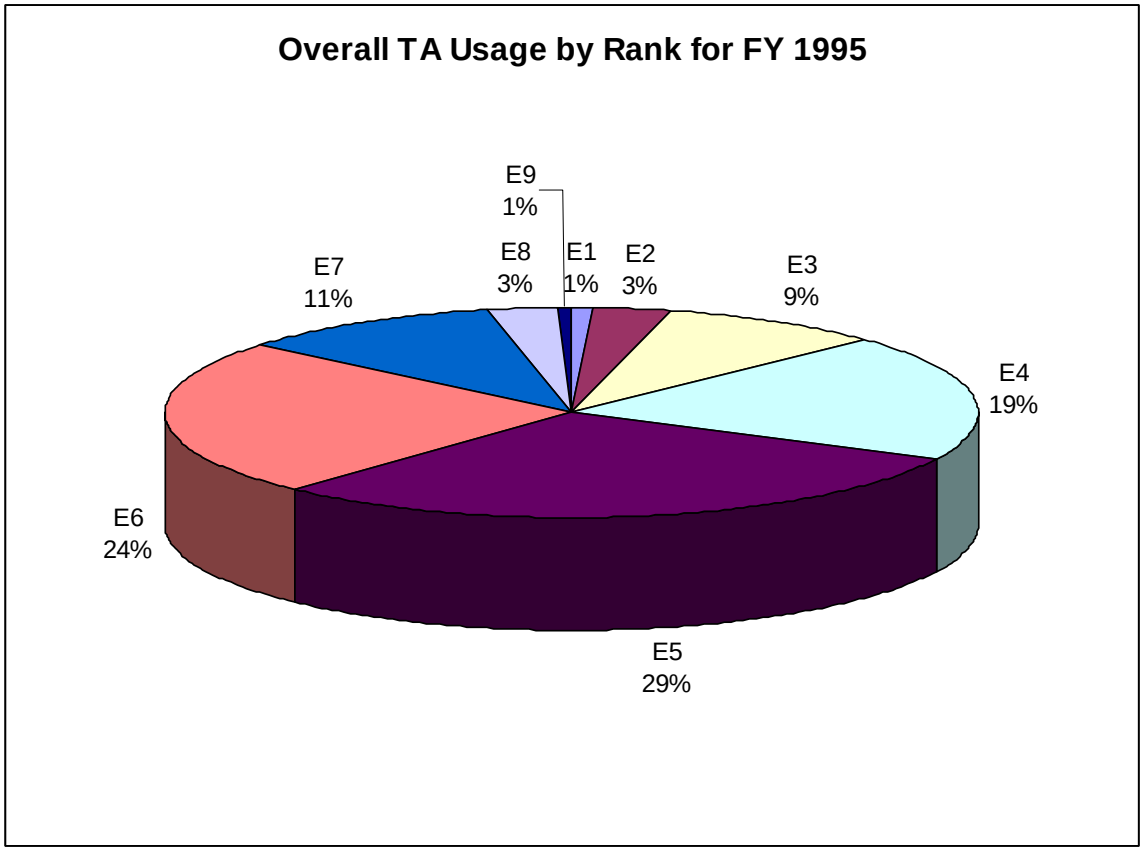

Figure 7. Overall TA Usage by Rank for FY 1995. Source NCMIS

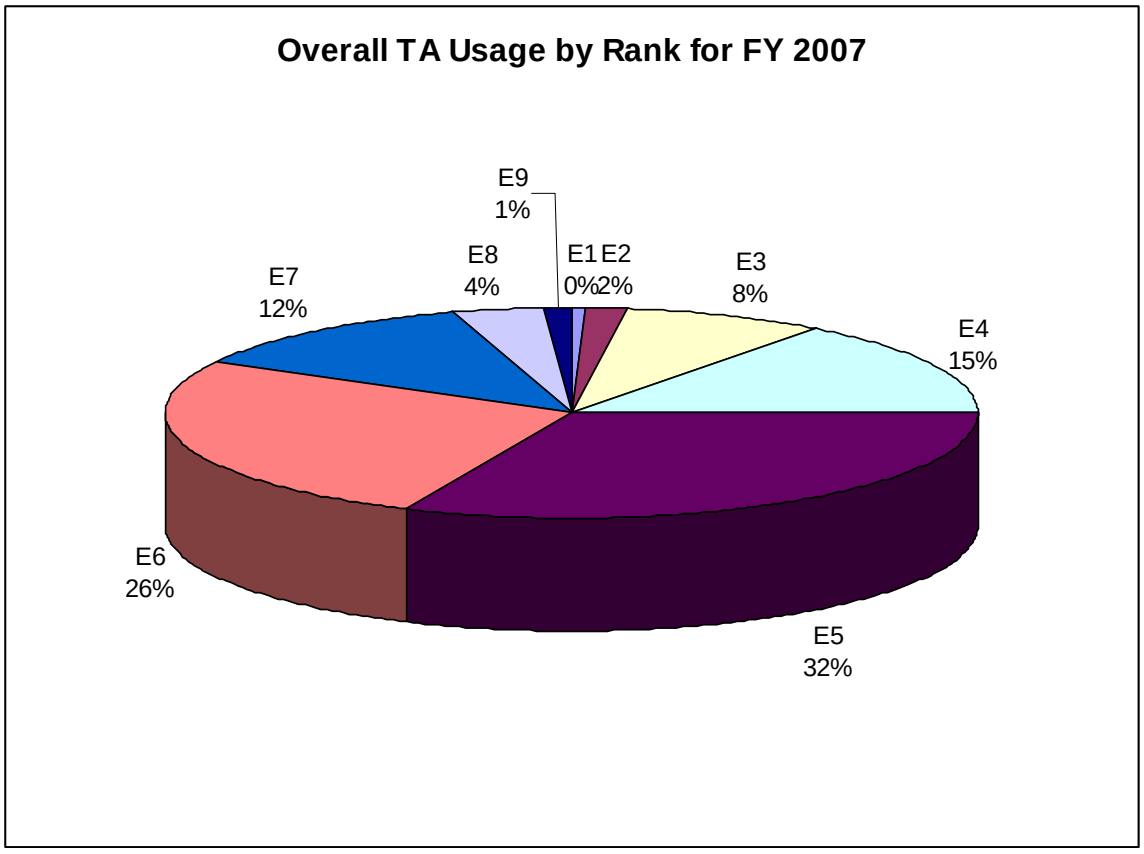

Figure 8. Overall TA Usage by Rank for FY 2007. Source NCMIS

Figure 9 describes the trend in TA participation rates for each rank and year. Data for the calculations can be found in Appendices E and F. Petty Officer Second Class (PO5) through Senior Chief Petty Officer (SCPO) have consistently participated at the highest rates in traditional TA, maintaining at least a 5% gap between E-3's and below from FYs 1995-2007. E-1s, by far, have consistently had the lowest participation rate(averaging less than 2%).

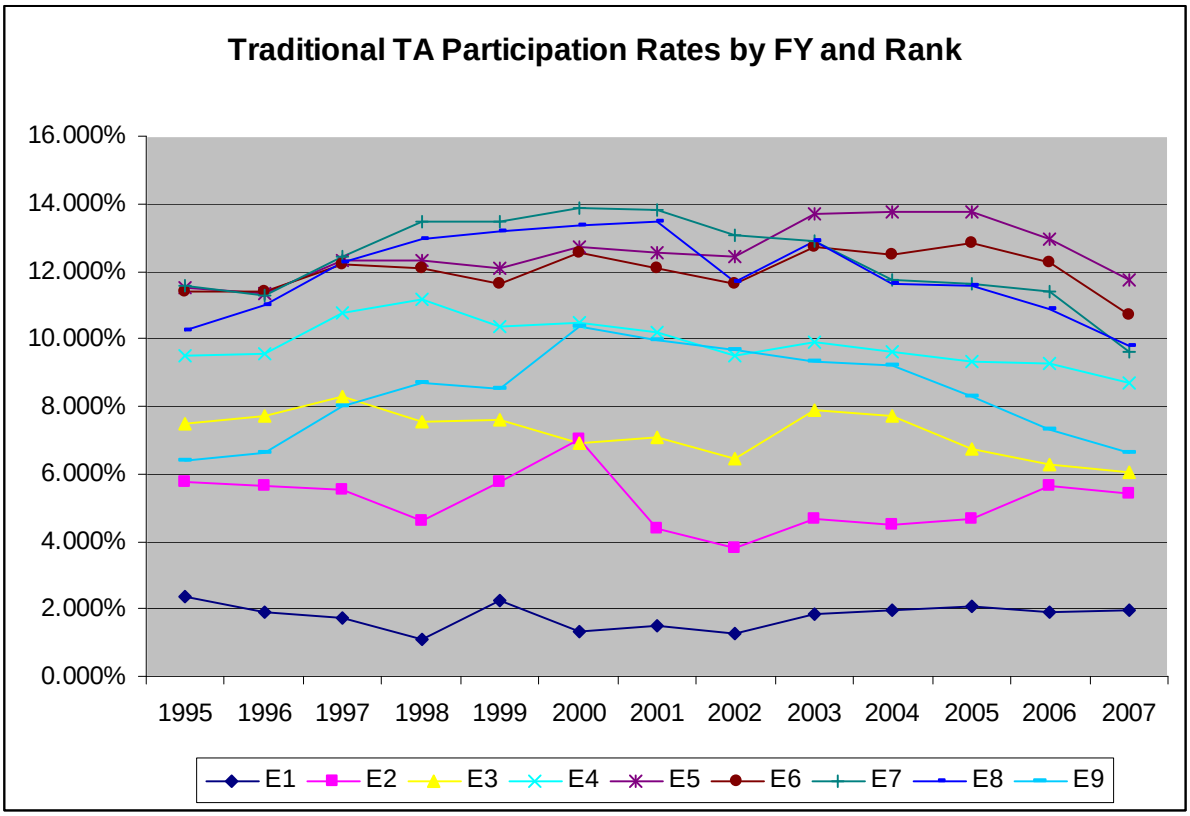

Figure 9. Traditional TA Participation Rates by FY and Rank. Source: NCMIS

DL participation rates follow expected patterns based on the literature, which shows that the average DL student tends to be more mature and career oriented. E-7s & E-8s have the highest DL participation rates averaging 20.5%. The DL participation rates are progressively lower for the lower ranks (all the way down to 1.1% for E-1s). Interestingly, gaps in traditional participation rates (1.45%) between ranks for E-3 through E-8 are smaller on average than those of DL (3%) as depicted in Figures 9 and 10. The larger gaps may be due to maturity and career status increases associated with higher ranks. Lower participation rates for Master Chief Petty Offices could be

explained by either heavy work demands from command duties or lack of necessity to continue investing in human capital after having attained the highest enlisted rating possible.

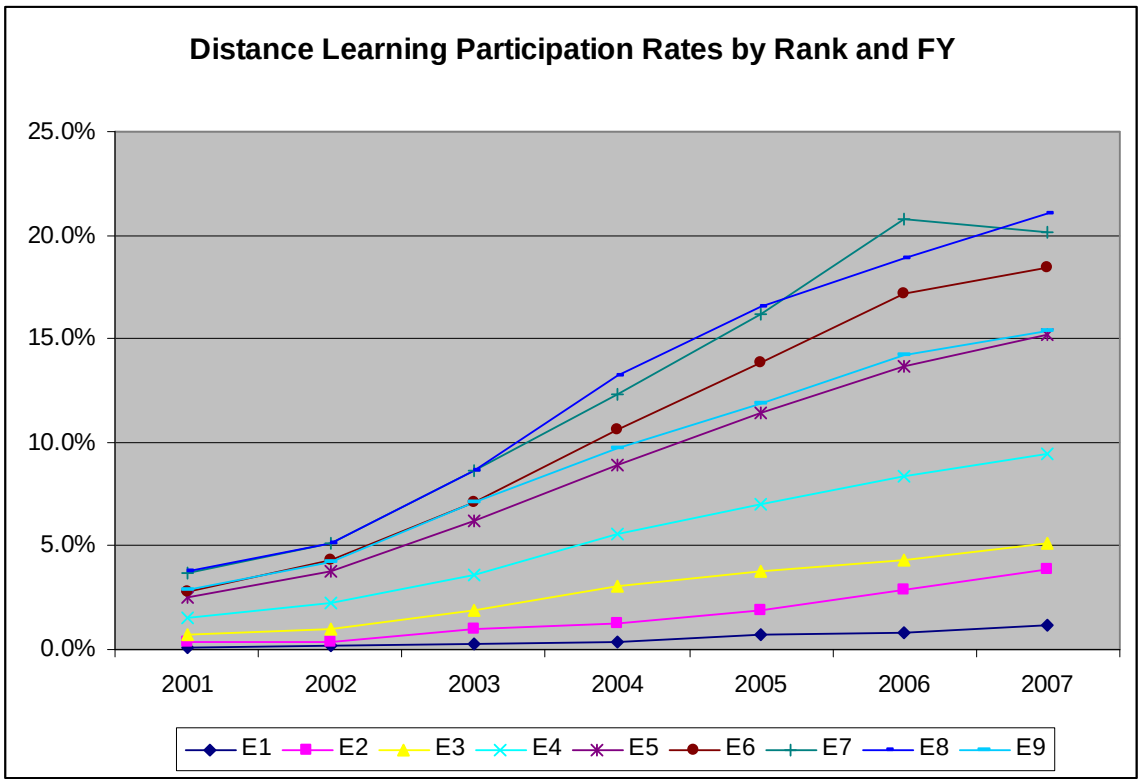

Figure 10. Distance Learning Participation Rates by Rank and FY. Source: NCMIS

D. DIFFERENCES IN TA USAGE BASED ON GENDER

The active duty enlisted force has become increasingly more diverse in recent years. During the 13-year period investigated in this study, the population of females in the Navy grew by 3 percentage points from 11.6% to 14.3%. During the 26% reduction in active duty enlisted sailors, female strength was reduced by only 8% while male numbers dropped by 28%.

The data shows that females consistently participate in both DL and traditional TA at twice the rate of males. Table 3 summarizes participation rates by gender for each fiscal year and also by type of instruction method. This may be due in part to females looking to increase their net worth to the Navy in order to compensate for being unable to participate in combat intensive occupations, subsurface forces and other special operations commands that otherwise may hinder promotion opportunities. Alternatively, because females are primarily in occupations that have greater opportunities to use TA, they participate at higher rates than males. During the 1000% increase DL TA usage male participation rates grew by 8% while female rates surged by 17% (Figure 12). Although males accounted for nearly 86% of the force in FY 2007 they participated in only 75% of the TA courses taken by active duty enlisted sailors.

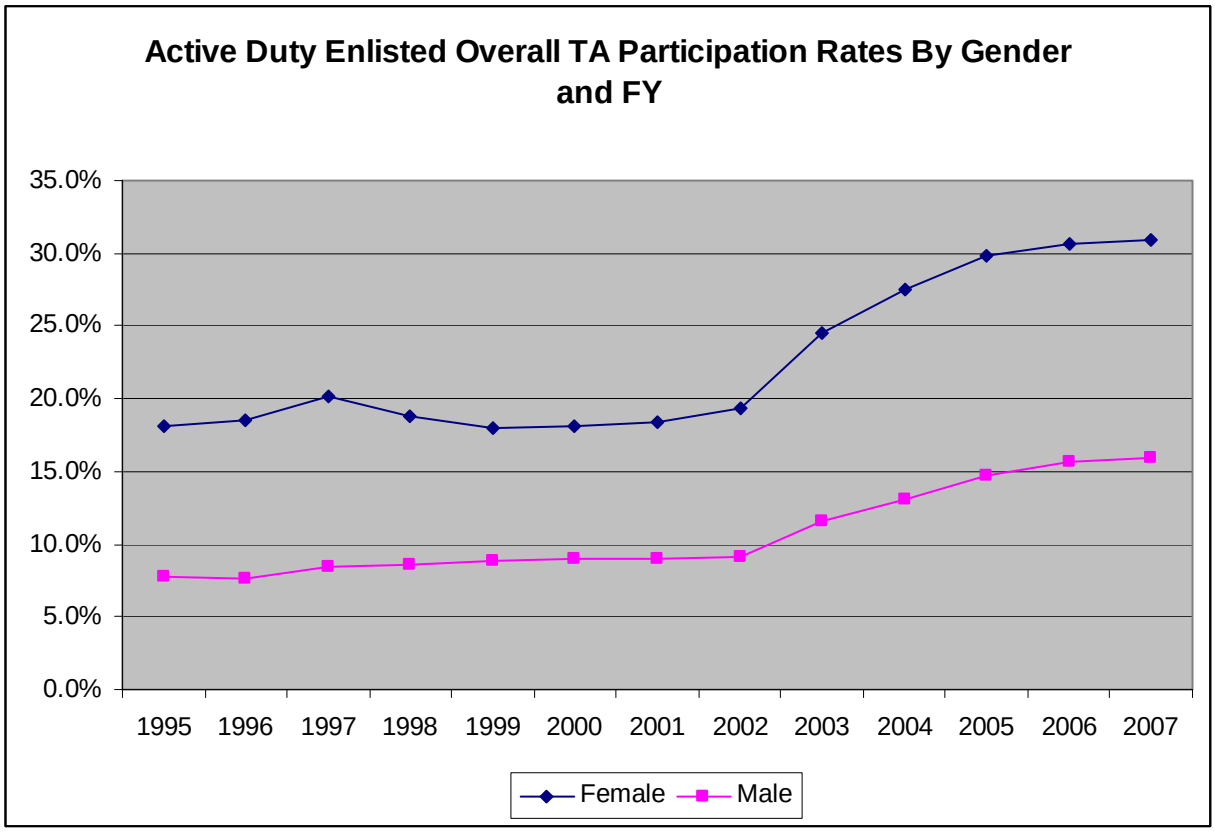

Figure 11. Active Duty Enlisted Overall TA Participation Rates By Gender and FY. Source: NCMIS

Table 3. DL and TA Participation Rates by Gender

	Active Duty Enlisted DL TA Participation Rates by Gender						
	2001	2002	2003	2004	2005	2006	2007
Female	3.41%	4.99%	8.66%	12.59%	16.00%	18.43%	20.44%
Male	1.57%	2.28%	3.89%	5.90%	7.71%	9.40%	10.28%

	Active Duty Enlisted Traditional TA Participation Rates by Gender						
	2001	2002	2003	2004	2005	2006	2007
Female	14.28%	16.47%	18.72%	18.58%	17.88%	16.77%	15.15%
Male	8.15%	7.69%	8.65%	8.49%	8.55%	8.14%	7.45%

E. DIFFERENCES IN TA USAGE BY RACE

Between FY 1995 and 2007 the Navy has become more diverse with respect to its racial composition. In FY 1995 African Americans comprised two thirds of all minorities and Caucasians accounted for nearly 70% of the total active duty enlisted force (see Figure 13).

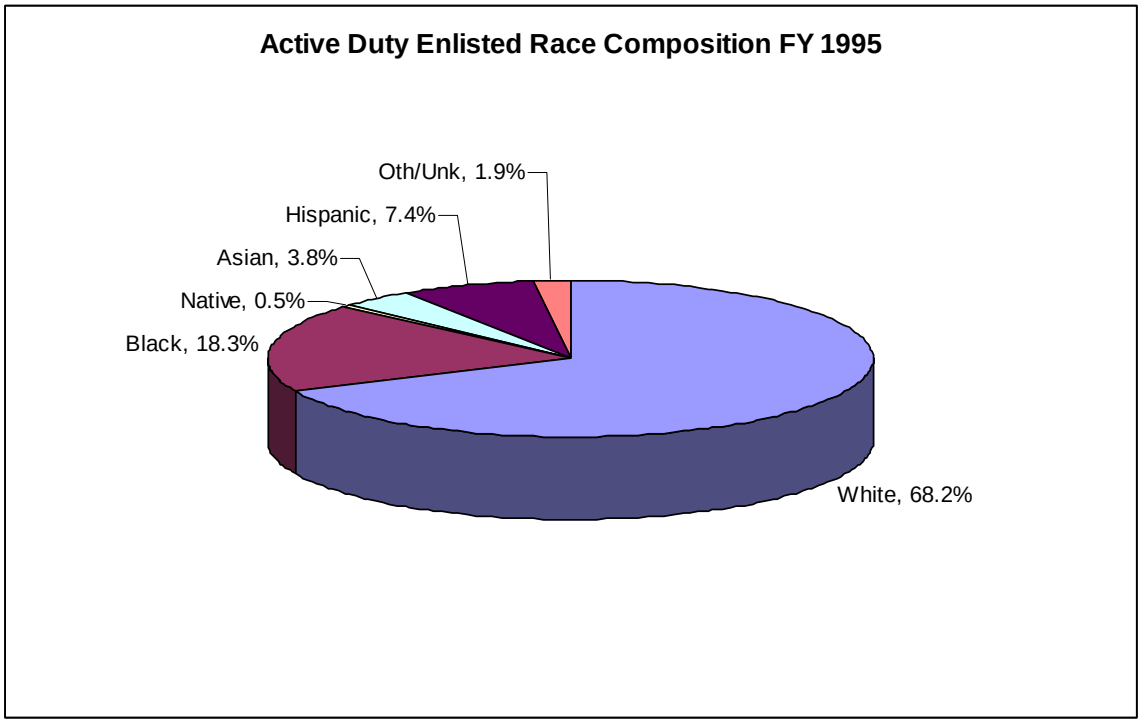

Figure 12. Active Duty Enlisted Race Composition FY 1995. Source: DMDC.

Minority representation steadily grew, and by FY 2007 minorities accounted for 47% of the force. The Hispanic population in particular has grown from 7% to 15% of the total force strength (Figure 14). The data also indicate that TA participation rates vary largely by race. Excluding Native Americans, minorities participate in TA at higher rates than whites. Figure 15 indicates that minorities participate at especially higher rates in traditional

methods of instruction. For example, in recent years African Americans and Hispanics have participated in traditional TA at rates 3% to 4% higher than whites.[40]

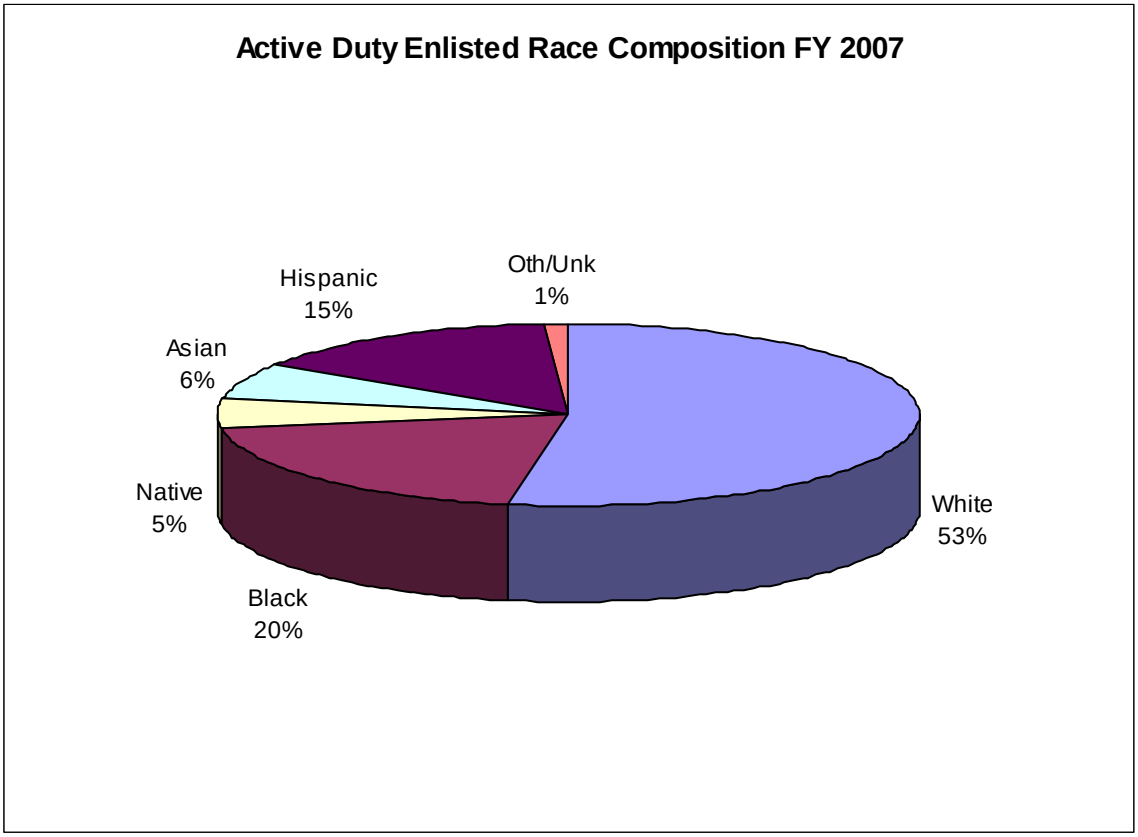

Figure 13. Active Duty Enlisted Race Composition FY 2007. Source: DMDC.

[40] Significant changes in coding of races and ethnicity occurred after FY 2003. The number of service members coded with "Unknown" or "Other" was 5,496 in FY 2004 dropping to 3,364 by FY 2007 using the same coding regiment. This may have had subtle inflationary effects on minority participation rates in FY 2004 and FY 2005 while corporate coding practices were adjusted.

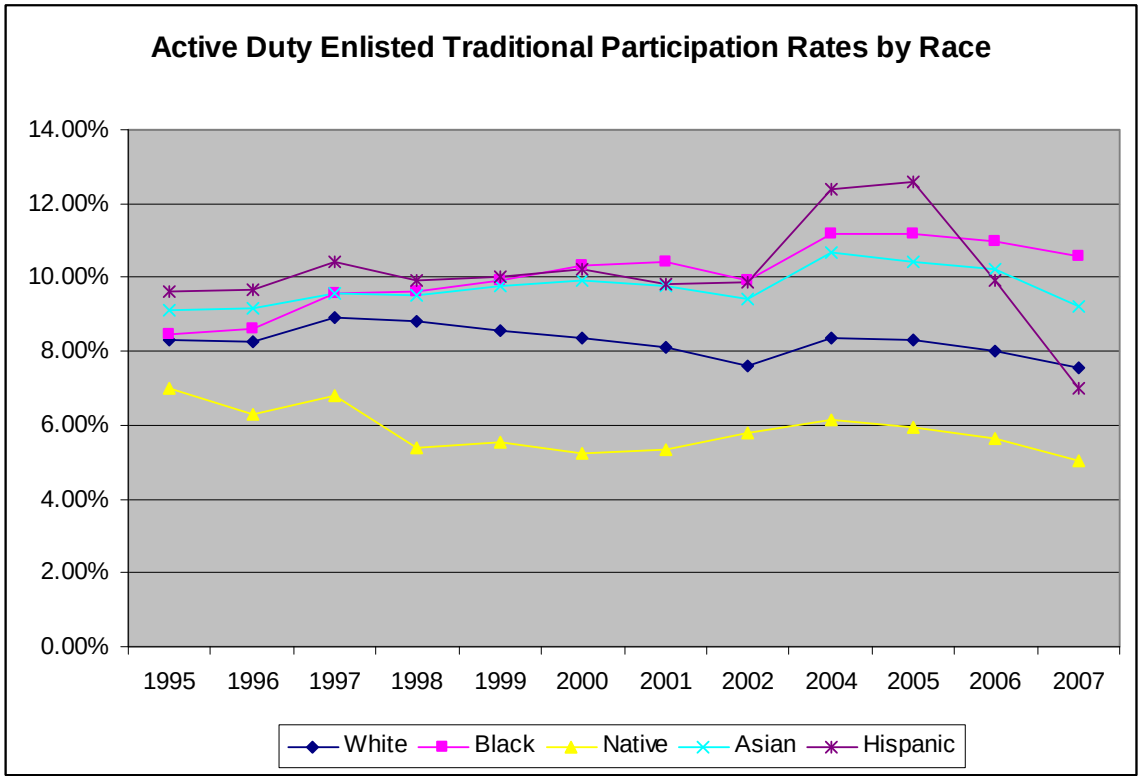

Figure 14. Active Duty Enlisted Traditional Participation Rates by Race. Source: NCMIS

DL participation rates for all races have grown significantly since FY 2000. In particular, African Americans have increased their participation in DL from 1.4% in 1995 to 13.7% in FY 2007. In FY 2006 and FY 2007 Hispanic TA participation rates dropped steeply in both DL and traditional methods of instruction. Traditional TA participation rates in particular registered the largest drop of 5.5 percentage points in two years. This may be due to Hispanic participation rates in the Navy being at an all time high in FY 2007, while total Hispanic participants in TA remained stable.

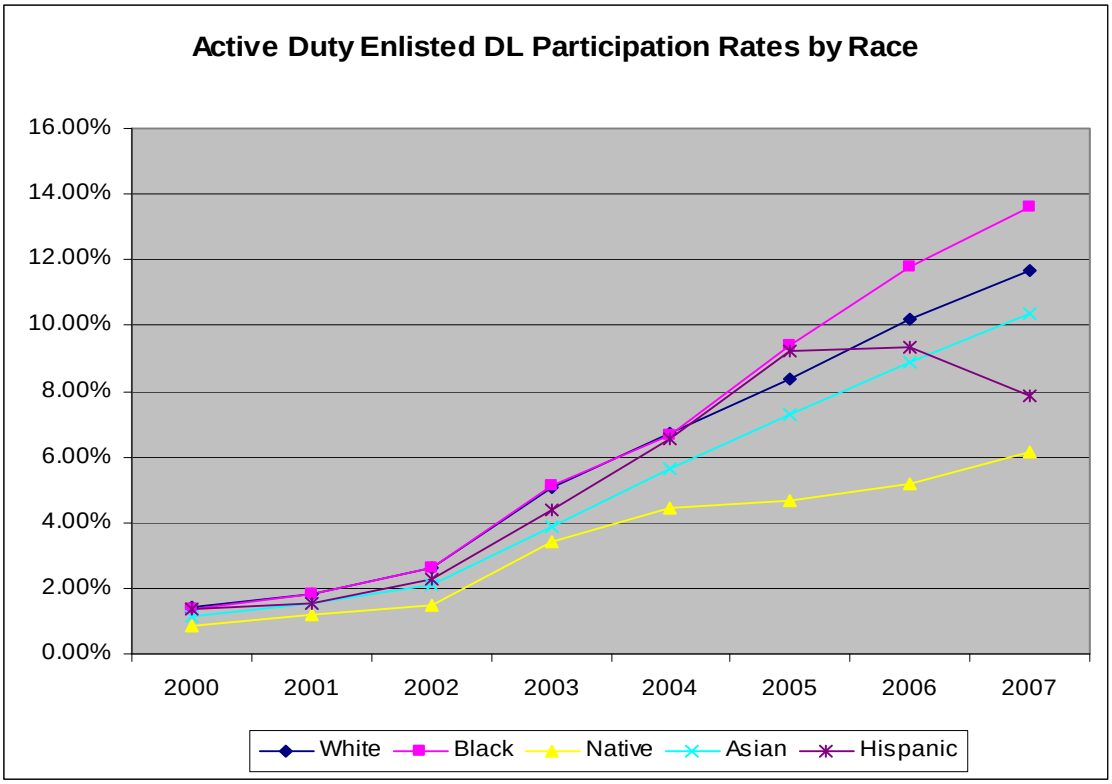

Figure 15. Active Duty Enlisted DL Participation by Race. Source: NCMIS.

F. DIFFERENCES IN TA USAGE BY COURSE TYPE

To better understand the comparison between methods of instruction, an understanding of the course distribution is necessary. The data provided by NETC includes both the full and short names of each course taken by students. With almost 2 million observations between FY 1995 and FY 2008 there were tens of thousands of course names. I aggregated course names into broad categories to provide an overview of the types of courses taken by recruits via DL and traditional method. Both full and short names were utilized to group courses into Business, History, Math, Natural Sciences, Physical Sciences, Information Technology,

Humanities, English, Medical, Technical (undergraduate) and Law. Using the most recent FY in the TA data (FY 2007) several significant differences in course distribution by method of instruction were found.

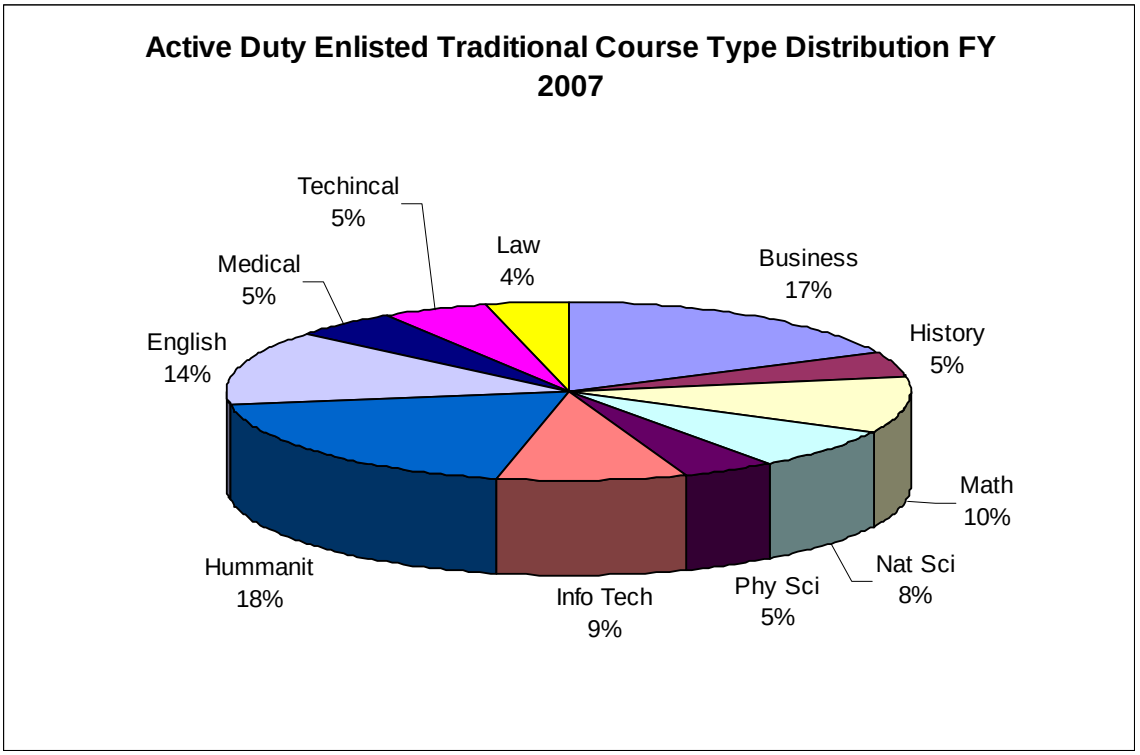

Figure 16. Active Duty Enlisted Traditional Course Type Distribution FY 2007. Source: NCMIS

It appears that students tend to utilize traditional TA in larger percentages for English, Physical Sciences, Math, and Technical courses. The largest difference is observed for English courses which are 3 times more likely to be taken via traditional TA than DL (Figure 17).

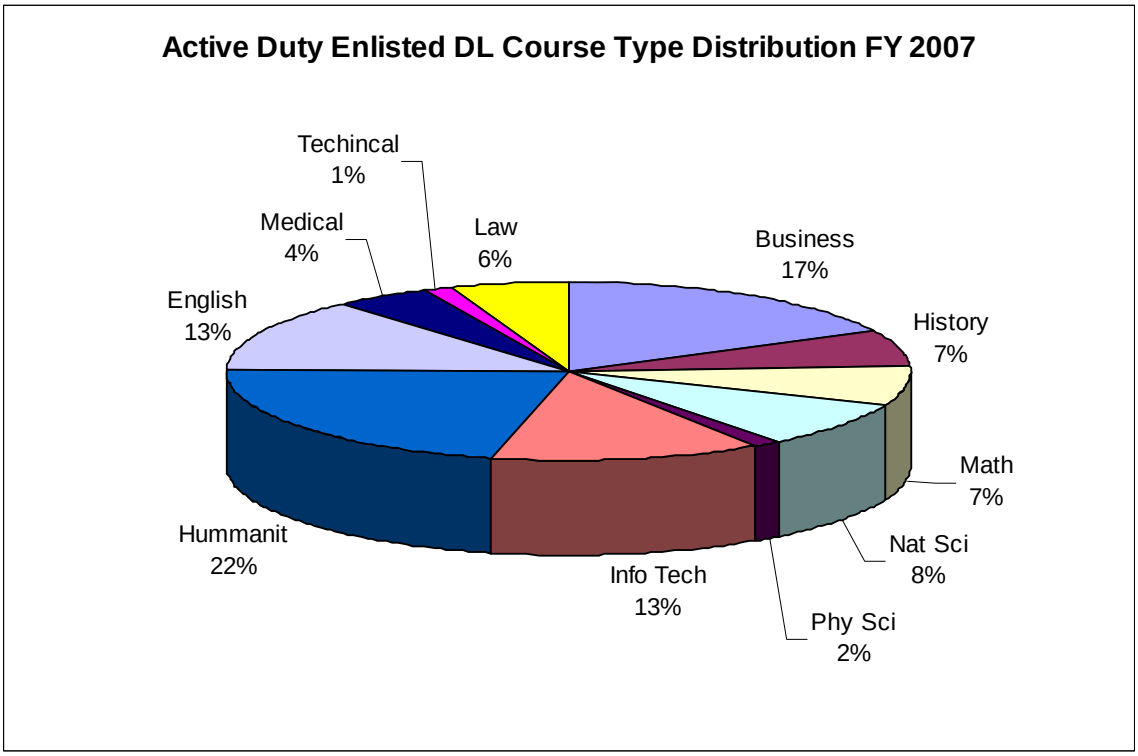

Figure 17. Active Duty Enlisted DL Course Type Distribution FY 2007. Source: NCMIS

This may be in part due to a lack of course offerings by educational institutions for classes that traditionally have a hands-on approach. Students participating in DL take Humanities and Information Technology courses at higher rates than traditional students. As discussed in the literature review, students who take DL tend to have more experience with computers than traditional students; DL may have a complementary effect to Information Technology leading to greater student participation than in traditional TA. Overall DL course use is on the rise with steep increases in Humanities, Business, and Information Technology (Figure 18), while traditional course use is

decreasing. Some of the decrease may be a result of the increased operational tempo due to support of ongoing military operations since FY 2001.

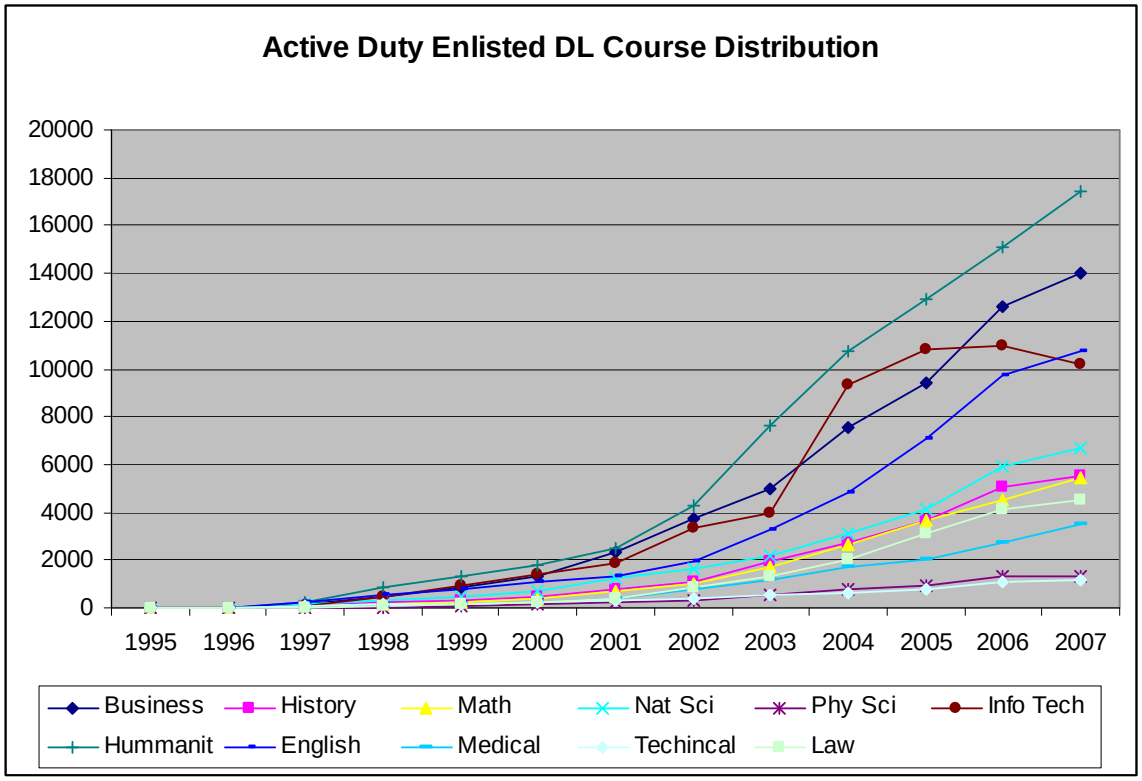

Figure 18. Active Duty Enlisted DL Course Distribution. Source: NCMIS

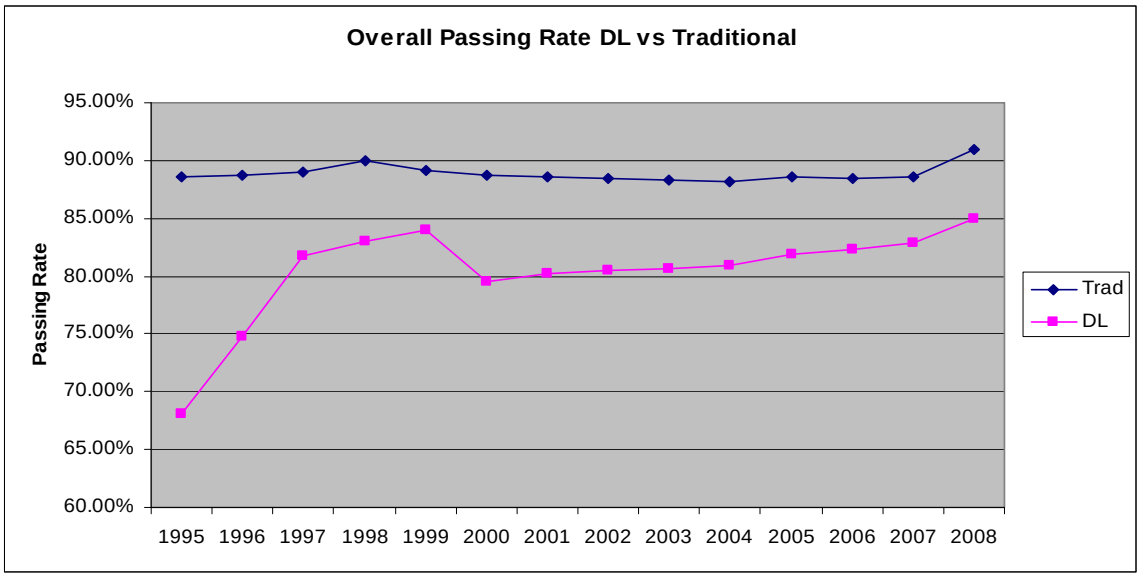

Figure 19. Overall Passing Rate DL vs Traditional. Source: NCMIS

Next, the differences in passing rates between DL and non-DL courses were investigated. Figure 19 depicts the gap in course-completion rates for each method of delivery. Overall the data shows traditional TA classes to have higher passing rates than DL classes with a gap of 9% in FY 2000. However, the gap steadily closes to under 6% in FY 2007 (Figure 19). This steady decrease may occur in part to educational institutions continuing to build corporate knowledge in effective DL delivery techniques and the Navy's continued proliferation of access to computers and internet to every sailor in the Navy. The passing rate gap was largest for the Physical Sciences starting at 13% in FY 2000 and decreasing to 7% in FY 2007 (Figure 20).

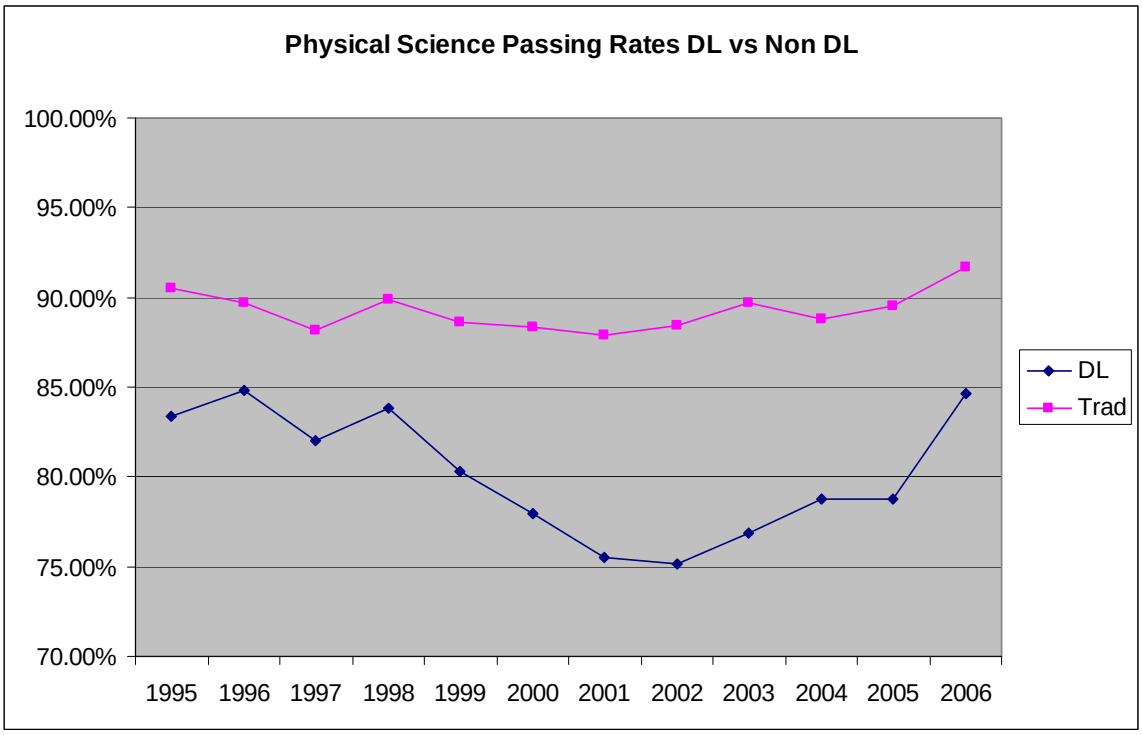

Figure 20. Physical Science Passing Rates DL vs Non DL. Source: NCMIS

G. DATA CONCLUSIONS

In summary, TA participation grew steadily between FY1995 and FY2007 even though the active duty enlisted force was reduced by over 100,000 sailors during the same period. DL has seen the largest gain with usage growing by a 1000% since FY2000. E-5s and E-6s have the highest TA participation rates among the enlisted ranks. Overall, females and minorities participate in TA at higher rates than white males. Finally, passing rates for DL courses are lower than for traditional courses; however the gap has decreased from over 9% in FY2000 to less than 6% in 2007.

All observations made in this chapter are based upon tabulations and simple summary statistics. Findings in this

chapter may not be systematic in nature. Further analysis of the data with multivariate models will be needed to estimate the causal effects of the method of instruction, sailor demographics, and course types on course completion rates and career progression. Chapter IV covers the methodological approach utilized in the study along with the results of multivariate modeling using data provided by NETC and DMDC.

THIS PAGE INTENTIONALLY LEFT BLANK

IV. SPECIFICATION OF MULTIVARIATE MODELS

A. INTRODUCTION

This chapter discusses the specification of the multivariate models used to estimate differences between the effects of classes taught via DL and those taught by traditional methods of instruction. It discusses the final data set created by merging nine enlisted cohort files provided by the Defense Manpower Data Center (DMDC) with Tuition Assistance data from the Naval Education and Training Command (NETC). The chapter also describes the explanatory variables and their expected effects on retention, performance, and TA completion rates. Finally, the chapter explains the estimation methodology and the relevant treatment and control groups used to obtain unbiased program effects.

B. BASIS FOR MULTIVARIATE MODEL SPECIFICATION

Based on previous studies the keys to estimating the differences in effects between DL and traditional methods of instruction are specification of the control group, inclusion of exogenous control variables, and adjustment for potential selection bias. Utilizing more than one fiscal year cohort would also improve the generalizability of the research.

Identifying the relevant treatment and control groups has played a critical role in the estimated TA results in previous studies. To ensure that all sailors have had similar opportunities to utilize the Navy’s TA program, the

study restricts the sample to Navy, first term, four-year contract sailors who completed at least 3 years of service. The study considers undergraduate level courses "general education." Restricting the sample to sailors who have completed at least 3 years of service is consistent with prior studies conducted by Buddin and Kapur (2005) and Mehay and Pema (2009).[41],[42]

Since the focus of this thesis is the effect of TA delivered via DL, the analysis also addresses specific concerns regarding the estimation of the effect of distance learning. More specifically, this study includes adequate control variables for life and work demands, by supplementing TA participation data from NETC with DMDC data on sailor demographics at the time of the retention decision. Data obtained from DMDC provides details on student demographics, ability (AFQT scores), as well as proxies for work and life demands, such as rating and marital status from entry into the Navy until the date of separation.

The thesis derives causal effects of TA by exploiting a natural control group involving individuals who reveal their motivation to invest in general education but, due to exogenous occurrences, do not complete their courses. This control group was proposed by Mehay and Pema and eliminates selection bias by comparing TA-users who were unable to complete classes to other TA-users who were able to

41 R. Buddin, and K. Kapur, 2005.

42 S. Mehay, and E. Pema, 2009.

successfully complete their classes. To improve the generalizability of the study, nine cohorts for FY 1994 to FY 2003 were used.

In order to focus on TA completion rates, a second model was created that includes variables to control for variations in the types of courses. The model controls for both observable and unobservable individual characteristics. In addition, courses were aggregated into groups with similar characteristics, such as math, business and history, to control for differences in course content.

C. DATA DESCRIPTION

The data consist of two data files, one from DMDC and the other from NETC. The DMDC complied data from quarterly "snapshots" of the Navy enlisted master file, augmented with Armed Forces Qualification Test (AFQT) scores and separation data. The snapshots include every enlisted service member on active military duty in quarterly intervals beginning in fiscal year 1994 and ending with the 4th quarter of fiscal year 2007. The data include information on demographics, contract length, career progression, and promotions. The augmented data includes the AFQT score for each service member and dates of separation with accompanying Interservice Separation Codes (ISC) that detail the reason for separation.

These data were restricted in several ways. Only Navy first term, four-year contracts were included in the sample. Sailors with longer contracts have longer training pipelines that may affect their career paths and retention decisions. The data are further restricted to sailors who survived

though three years of service in order to ensure that the sailors being compared had adequate time-in-service to participate in the TA program.

The NETC data includes every TA-funded class taken by sailors from calendar year 1995 to 2008. The data includes course name and type, method of delivery, course status (completed, in progress), final grades, basic demographic data and dates when the course commenced and date when it was completed. This data set was also restricted in several ways. First it was restricted only to courses taken by enlisted service members; all courses taken by officers were deleted. To avoid mixing remedial high school courses with college courses and graduate-level courses, we also restricted the course sample to undergraduate college courses that were taken during the sailors' first enlistment term. Individuals taking these different courses may have different motivations and goals, but the focus of this thesis is on the effects of general education on worker mobility and performance.

D. VARIABLE SPECIFICATION FOR RETENTION AND PERFORMANCE

1. Dependent Variable Specification

The dependent variables chosen for this study were selected based on previous studies conducted by Mehay and Pema (2009) and Buddin and Kapur (2005). The variables were chosen to measure the effects of general education funded by the Navy's TA program on the retention, performance and completion rates of first term enlisted sailors.

a. Reenlistment

Two variables were created for use as a basis to identify those sailors who stay in the Navy beyond their four-year contract. The first variable *reenlist* captures both reenlistments and extensions of service beyond the first enlistment and thus yields a higher retention rate than if the variable had been based solely on reenlistments. The main reason for this choice is that the cohorts 2002-2007 have not matured enough to observe their reenlistment decisions. However, DL usage rates spike after FY 2000. As a result, focusing only on reenlistments would exclude recent cohorts and most of the variation in DL participation and course completion patterns. However, recent cohorts may extend their existing contracts, and this decision can be used as a proxy for reenlistment.

A second variable (*reenlist2*) was also created that reflects sailors' actual decisions to reenlist and does not include extensions. It was created utilizing the ISC code for the first listed date of separation.[43] In models using this variable the sample is restricted to cohorts for FY 1994-2001.

b. Promotion to E-4 and E-5

The promotion variables take the value of 1 when the sailor is promoted to E-4 or E-5 in the first term of service, and 0 otherwise. Promotions to paygrades below E-4 are not investigated because these promotions are not competitive and depend solely upon time-in-grade

[43] A code value of 1100 represents a service member's choice to reenlist.

requirements. In contrast, promotions to E-4 and E-5 depend on performance tests and periodic evaluations by superiors. Promotion to paygrades above E-5 were not analyzed since very few recruits attain ranks above E-5 in the first four years of service. The promotion variables are named *prom_e4* and *prom_e5*. In the promotion models I restrict the sample to include only sailors who are eligible for promotion. For this, I create variables *e4_elig* and *e5_elig* based upon date of previous rank and the required time-in-grade for promotion to the next rank. These variables were used to restrict the sample for the promotion analysis to only those sailors eligible for promotion.

c. Successful Course Completion

In this study I define successful completion of a course as receiving a passing grade for a class. The variable *passed* takes a value of 1 to denote successful completion, whereas 0 represents a failing grade, an incomplete grade or a withdrawal from the course.

2. Explanatory Variable Specification

The explanatory variables were mainly chosen based on the Mehay and Pema (2009) study. The thesis also uses a similar methodological approach to adjust for selection bias. The section below provides a description of the variables and their expected effect on the outcome measures (retention and promotion). Table 4 below summarizes the explanatory variables and their coding.

a. TA Usage Variables

Several measures of TA participation were utilized to obtain the effects of TA usage on retention and performance of first term sailors. The first variable *pass_some* is a binary variable which takes a value of 1 if a sailor has ever passed a TA-funded undergraduate level course, and 0 if not. This indicator was chosen to identify recruits whose work schedules allow them to complete at least one course. However, the control group is not likely to include recruits of lower ability. This is because individuals who fail or otherwise do not complete courses due to their own poor performance are required to reimburse the Navy for the class in full instead. The robustness of this variable was tested by substituting both a continuous variable for number of classes passed and a variable for the percent of classes passed. The second and third variables were *dl_some* and *nondl_some,* which were constructed in the same manner as pass_some, but were based on passing DL and traditional classes, respectively.

Based on human capital theory, sailors who successfully obtain general training will increase their value to firms outside of the Navy. Thus, the likely effect of TA usage should be to reduce retention. However, due to evidence from previous studies and alternative theories on the effect of general education on worker mobility, there is a possibility that the empirical model could find a positive effect of TA on retention. Since general education may complement Navy-specific training, it can enhance worker productivity within the Navy, thus resulting in positive TA effects on both promotions and retention.

It is assumed that DL course completion will have greater positive effects on the dependent variables than traditional course completion, based on previous studies findings that DL students tend to be more career-oriented and more mature than traditional students. The Navy continues to put greater demand on sailors as they increase in rank making decisions between work, family and education increasingly difficult. The ability of the sailor to choose the time and location of the DL course would be beneficial to the completion of the Navy's missions resulting in greater positive effects than traditional courses on retention and promotion. However, based on several previous studies suggesting that DL students experience larger work demands than traditional students, sailors are expected to be less likely to successfully complete a DL course compared to a traditional classroom course.

b. Female

The *female* variable takes a value of 1 for females and 0 for males. Some previous studies indicate that females have lower course pass rates and promotion rates than males do. The expected outcome is that females will have lower pass rates and lower promotion rates than males.

c. Race/Ethnicity Variables

The minority race/ethnic categories chosen were based on previous studies and are *white*, *Black*, *Native American*, *Asian*, *Hispanic* and *other*. To measure the effect of minority status on the dependent variables *white* was

chosen as the omitted race/ethnic category. The race/ethnic variable was created from the earliest value on record for the new recruit. Previous studies have found higher retention rates for minorities than for whites, while promotion probabilities have been slightly lower.

d. Marital Status

The *married* variable takes a value of 1 if a sailor is married any time during the first enlistment term, and 0 otherwise. I expect that marriage will have a positive effect on all dependent variables based on previous studies.

e. Dependents

Depend2 is a continuous variable that captures the number of dependents at the time of the retention decision. In general, recruits with a larger number of dependents prefer steady job and promotions to maintain standards of living that sailors without dependents will not require. Previous studies in the DL literature have not found significant effects for dependents. The variable *depend2* is expected to have a small positive effect on the outcome variables.

f. Age

The *age* variable is a continuous variable based on age at the time of entry into the Navy. Based on previous studies, successful DL students tend to be older and more career-oriented. Additionally, older sailors will have had more life experiences than younger sailors. Age is expected to have a positive effect on all dependent variables.

g. Armed Forces Qualifications Test (AFQT)

AFQT is a continuous variable ranging from 0 to 99 and measures the percentile score in the Armed Forces Qualification Test. In this study AFQT is used as a measure of observed ability and aptitude for the military. The expected outcome is that AFQT will have a positive effect on all dependent variables.

h. Educational Attainment Categories

Mutually exclusive binary variables were used to account for the educational attainment of sailors at the time of entry. Sailors who had taken college courses prior to entering the Navy may have a higher propensity towards using TA. The educational attainment variables are *hs_dip* (High School diploma), *non_hs_dip* (No High School Diploma), *ged* (General Equivalency Diploma), and *some_col* (have taken at least 1 college course).

Previous studies have shown that not achieving a high school diploma is often a sign of lower motivation and persistence. Because the high school diploma group is the largest education category, it was chosen as the omitted group. I expect recruits with lower educational attainment to perform less well than those with greater educational attainment prior to joining the Navy.

i. Occupation Variables

In order to control for differences in promotion rates and proxy for employment opportunities in the civilian labor market, I created 33 binary variables for occupations based on the sailor’s occupational code at the time of

reenlistment. These variables were created utilizing coding from the DMDC Active Duty Military Personnel Edit File. The expected effect of each occupational category varies by dependent variable. The differences may capture sea-shore rotation lengths, work schedules, promotion opportunities, and civilian job opportunities.

j. Fiscal Year (FY)

Fiscal year dummy variables were created to control for variations in economic conditions or in naval polices that affect the decisions of entire cohorts. The fiscal year variables are based upon the service member’s date of entry into service. The Navy made a significant change to TA policy in 2002 when it changed from funding 75% of tuition costs to 100%. This would have the greatest effect on cohorts from FY 2000 and later.

Table 4. Variable Descriptions

Variable	Description
Reenlist	=1 if retention past first 4-year contract, 0=otherwise
Reenlist2	=1 if reenlisted, 0=otherwise
Prom_e4	=1 promoted to E-4 during first enlistment, 0= otherwise
Prom_e5	=1 if promoted to E-5 during first enlistment, 0= otherwise
Pass_some	=1 if passed a class, =0 otherwise
DL_some	=1 if passed a DL class, =0 otherwise
Nondl_some	=1 if passed a traditional class, =0 otherwise
Female	=1 if female, =0 if male
Black	=1 if African American, =0 otherwise
Native	=1 if Native American, =0 otherwise
Asian	=1 if Asian, =0 otherwise
Unknown	=1 if Race Unknown, =0 otherwise
Other	=1 if Other Race, =0 otherwise
Married	=1 if Married during enlistment, =0 otherwise
Divorced	=1 if Divorced during enlistment, =0 otherwise
Depend2	=Dependents in 3rd year of service, =0 None
Age	=Age at accession
Afqt	=AFQT score at accession, =. if missing
Non_hs_dip	=1 if no high school diploma at accession, =0 otherwise
GED	=1 if GED at accession, =0 otherwise
Some_col	=1 if college credits at accession, =0 otherwise
Occupations dummies	=1 for each occupation category in 3rd year, =0 otherwise
FY dummies	Dummies denoting the entry fiscal year

E. VARIABLE DESCRIPTION FOR THE COURSE COMPLETION MODEL

1. Dependent Variable

To investigate the probability of successfully completing a DL course versus a non-DL course, a different methodology will be followed than the one used for estimating the effect of TA on career progression. More

specifically, this model needs to take into account unobserved differences between recruits who take DL courses versus recruits that take traditional courses. As a result, the explanatory variables used in the course completion models will be different from those described above. It should be noted that the course completion models will carry out the analysis at the course-level, rather than the individual-level.

a. Successful Completion of TA Course

Passed is an indicator of whether an individual class was successfully completed. A value of 1 equals success while 0 indicates that the class was failed or otherwise not completed.

2. Explanatory Variables

The methodological approach for estimating the effect of DL on course completion rates requires that the explanatory variables used in the model vary over time. As a result, recruit demographics and AFQT scores are not included in these models.

a. Distance Learning

Dumdl equals 1 if the class taken was delivered via DL and 0 if the class was taught traditionally. The distinction between a DL course and a traditional course comes from a variable in the NETC dataset that catalogs the method of instruction for each class taken. Based upon previous studies I expect that the DL variable will have a negative effect on completion rates. This result may be

heavily affected by the type of class and maturity of the student. For these reasons, the DL indicator interacts with both course types and student paygrade.

b. Fiscal Year

Binary variables for each fiscal year were also used to control for policy differences and other factors that change over time. With the policy change in 2002 that changed reimbursement from 75% to 100% of tuition costs I expect that years after 2001 may be characterized by lower completion rates. The change in policy has reduced the risk that the recruit undertakes by committing to take a course. As a result, they may take more courses after 2001, even when circumstances or work schedules may appear less favorable than before.

c. Course Type

Binary course subject variables also are included in the model. The course types were based on common established post-secondary education categories. The categories are *business*, *history*, *math*, *natscience* (Natural Sciences), *physcience* (Physical Sciences), *infotech* (Information Technology), *humanities*, *english*, *medical*, *technical*, and *misc* (miscellaneous). Most courses in the sample are in the category of humanities, which is therefore used as the control group in the models estimated below. The signs and significance for these variables are expected to vary for DL and traditional courses, based on the degree of difficulty of teaching certain subjects in a DL environment.

d. Rank

Rank variables control for the rank at the time the course was taken and proxy for work schedules and time constraints. Grades E-1 to E-3 were aggregated into the category *nonrate* due to the small number of observations and the lack of performance factors that separate them from other ranks such as rating examinations, periodic evaluations, and board selection. As E-5's were the largest consumers of TA, they were chosen as the control group. The expected outcome is that completion rates will increase with rank.

F. SAMPLES AND DESCRIPTIVE STATISTICS

1. Retention and Performance

The sample was first restricted to Navy, first term, four-year contracts between FY 1994 and FY 2003 with no prior service. This restriction is consistent with Mehay and Pema (2009) and resulted in 381,455 active duty enlisted accessions during this period. The average annual number of accessions each year was approximately 34,000, spiking to approximately 45,000 between 1997 and 2001 before dropping to 37,000 in 2002-2003.

To ensure sailors had a comparable period of time to utilize TA, the sample was restricted to sailors who completed at least three years of their first-term enlistment contract. This reduced the number of observations to 278,474. Table 5 provides a comparison of descriptive statistics for the full sample, and separately for TA-users and non-users. The overall TA participation

rate in the first four-years of service was 16%. High school diploma holders comprised the largest education accession group (87.2%) and females comprised 17% of new recruits. The minority makeup of the full sample is consistent with Mehay and Pema (2009) with African Americans constituting the largest minority group at 19%, Hispanics at 11.7% and Asians with 5.3%.

Table 5. Descriptive Statistics for Full and TA Samples

Variable	Full Sample	TA-Users	Non-Users
TA Usage rate	.159	--	--
TA Completers	.130	.820	--
DL completers[a]	.029	.75	--
Non-DL completers	.114	.856	--
Reenlist & Extensions[b]	.681	.747	.668
Reenlist rate[c]	.379	.351	.383
Promote Rate E4	.856	.899	.842
Promote Rate E5	.239	.258	.235
Age (years)	.199	.201	.199
AFQT Score (percentile)	.612	.633	.608
Female	.171	.348	.137
Married	.398	.432	.391
White	.599	.556	.608
African-American	.187	.199	.185
Hispanic	.117	.136	.113
Asian	.053	.065	.050
H.S. Diploma	.872	.888	.869
No H.S. Diploma	.054	.04	.057
GED	.030	.025	.031
Some College	.044	.047	.043
Sample Size	278,474	44,251	234,223

[a] TA-User sample was restricted to DL or Non-DL users respectively.
[b] Variable includes all sailors who reenlisted or extended past their initial enlistment.
[c] Reenlistment rate sample was restricted to FY1994-FY2001 in order to utilize ISCs to distinguish reenlistments from extensions.

Of the 44,251 TA-users, 82% successfully completed at least one course (Table 5). However, in Table 6, the DL-users' completion rate (.75) was lower than that of traditional users (.85). Women used TA at over twice the rate of men (32% vs. 12.4%). Women had slightly higher overall TA successful completion rates than men (83% to 81%)

overall, and also for DL and traditional classes. Asians had the highest overall percentage of successful completions (85%) and Native Americans had the lowest (79%). Whites achieved the highest DL pass rates (76.5%) whereas African Americans had the lowest (71.3%). TA-users with higher education levels at accession have more success in completing at least one course. TA-users with some college had DL successful completion rates of 77.7% while GED holders and sailors without a high school diploma had the lowest rates (72.8% and 69.7%, respectively).

To adjust for selection bias the same models that are estimated for the full sample are estimated for a sample restricted to TA-users only. Table 6 provides descriptive statistics for the TA sample. DL users are only 1.1% less likely to reenlist then those taking traditional classes, but are 2.4% more likely to extend their service beyond their first 4 years of service than traditional users. Females are more likely to use DL than males and DL sailors have higher AFQT scores than traditional students. DL students are more likely to be married than traditional students. All minorities participate in traditional TA at higher rates than DL, whereas whites are the only race to prefer DL. Sailors with some college are 20% more likely to utilize DL than traditional TA.

Table 6. Descriptive Statistics for Full and TA Samples

Variable	Overall TA	DL TA	Traditional
TA Completers[a]	.820	.75	.856
Reenlist & Extensions[b]	.747	.763	.745
Reenlist rate[c]	.351	.315	.353
Promote Rate E4	.899	.931	.895
Promote Rate E5	.258	.359	.239
Age	.201	.204	.200
AFQT Score (%)	.633	.656	.627
Female	.348	.365	.356
Married	.432	.502	.417
White	.556	.592	.542
African-American	.199	.186	.205
Hispanic	.136	.114	.142
Asian	.065	.051	.068
H.S. Diploma	.888	.882	.889
No H.S. Diploma	.04	.035	.041
GED	.025	.027	.024
Some College	.047	.057	.046
Sample Size	44,251	10,854	36,928

[a] TA-User sample was restricted to DL or non-DL users respectively.
[b] Variable includes all sailors who reenlisted or extended past their initial enlistment
[c] Reenlistment rate sample was restricted to FY's 1994-2001 in order to utilize ISCs to distinguish reenlistments from extensions.

2. Successful Completion Rates

The data is based on the population of 1,960,592 individual TA-funded courses taken by all active duty Navy personnel between FY 1995 and FY 2008. The sample is restricted to enlisted personnel taking undergraduate courses only, leaving 1,641,740 observations.

G. MODEL SPECIFICATION

1. Course Completion Rates

Previous literature indicates that DL users are very different from those taking traditional courses. Therefore, the estimation of the differential effect of DL on completion rates versus traditional courses needs to account

for unobserved heterogeneity. For this purpose I estimate course-completion rates via an individual fixed effects model. I focus on course-level data, and obtain the estimates from individuals who take both DL and non-DL courses. This method holds constant everything about an individual that does not change over time, including unobservables such as motivation and ability. As a result, any bias from the non-random selection of individuals into DL and non-DL courses is removed, and the estimates have a causal interpretation. More specifically, I assume that the probability of passing a course is determined via the following model:

$$P(pass_{it} = 1 | X_{it}, a_i) = \alpha + \beta DL_{it} + \gamma_i Subject_i + \delta_t FY_t + \phi Rank_{it} + a_i + u_{it} \qquad (1)$$

In this model, a_i represents unobserved individual characteristics that remain constant over time and are correlated both with the likelihood of passing a course and possibly with whether a recruit chooses to take the course via DL or traditional methods. The fixed effects method eliminates this term (and, consequently the source of bias). In doing so, it also eliminates all other observable individual attributes that remain constant over time, such as gender, race, AFQT scores, etc. Therefore, these variables are not included in model (1). Additionally, to further isolate the effects of method of instruction, the model includes variables to control for differences by course type and rank as well as FY dummies to control for yearly effects.

2. Distance Learning Participation Determinants

Determinants of TA participation, retention, and performance models are estimated via non-linear maximum likelihood techniques, assuming normally distributed errors (Probit Model). The probit model is appropriate because variables for participation in TA, the retention decision, and promotions are dichotomous (success is represented by 1 and failure by 0).

Chapter III indicated that TA participation may vary by demographic differences. Additionally, previous TA studies have found TA-users to be different than non-users. To establish a baseline for participation in the Navy's TA program, probit models were estimated for the determinants of overall, DL and traditional TA participation. Model (2) was used to separate the determinants of TA participation from potential systematic occurrences in the data.

$$P(TA-user=1\mid X_i)=\alpha+\beta_1 Female_{i1}+\beta_2 Race_{i2}+\beta_3 Married_{i3}+\beta_4 Dependents_{i4} \\ +\beta_5 Age_{i5}+\beta_6 AFQT_{i6}+\beta_7 Education_{i7}+\beta_8 FY_{t8}+u_{it} \quad (2)$$

3. Retention Models

As discussed in the determinants of TA participation section, TA-users have been found to differ from non-users. In particular ability and motivation are likely higher for TA-users.[44] In order to draw unbiased inferences from the data, the unobserved errors must be equal for all sailors

[44] R. Buddin, and K. Kapur, 2005.

included in the sample. In order to estimate the effects of passing a course using TA on retention and promotion, the following models were estimated:

$$P(\mathrm{Re}tention = 1 \mid X_i) = \alpha + \beta_1 TA_{i1} + \beta_2 Female_{i2} + \beta_3 Race_{i3} \ldots + \beta_k FY_{tk} + a_i + u_{it} \quad (3)$$

$$P(\mathrm{Pr}omote = 1 \mid X_i) = \alpha + \beta_1 TA_{i1} + \beta_2 Female_{i2} + \beta_3 Race_{i3} \ldots + \beta_k FY_{tk} + a_i + u_{it} \quad (4)$$

Both models (3) and (4) employ the same set of explanatory variables utilized in model (2) with the inclusion of TA variables based on method of instruction(overall, DL and traditional). In these models, a_i depicts unobserved individual characteristics that differ between sailors, but are correlated with both successfully passing a TA course and the desired outcomes(retention and promotion). Two measures were taken to mitigate a_i. First, the AFQT variable was included in the models and acts as a proxy for ability. Secondly, the sample was restricted to TA-users only. Restricting the sample to only TA-users eliminates differences in motivation between sailors who choose to participate in the Navy's TA program and sailors who do not. Removing the bias created by self-selection from the model allows for a casual interpretation of the estimates.

In order to provide a baseline for comparison of estimates from previous studies that did not restrict the sample to TA-users only, models were also run with a "full sample" that is restricted to all sailors with four-year contracts who have completed their first three years of service.

THIS PAGE INTENTIONALLY LEFT BLANK

V. MODEL RESULTS

A. COURSE COMPLETION MODEL

Numerous DL studies have attempted to compare DL completion rates with those of traditional courses. Early studies showed completion rates 20%-25% lower for DL than traditional courses. Differences in student demographics and the volume of courses taken in different areas of education are two complications with comparing DL to traditional course completion rates. Lack of reliable and extensive data has been another common issue plaguing researchers. Utilizing data from NETC that covers every TA-funded course taken by Navy sailors can fulfill the requirements for reliable and extensive data with a sample size of 1,641,740 observations on undergraduate level courses taken between FY 1995 and 2008. Also, controlling for course subject provides for a better comparison between DL and traditional methods of instruction.

The model used to analyze the determinates of completion rates is an individual fixed effects model that eliminates heterogeneity that is constant over time due to factors such as race, gender, aptitude, motivation, and initiative. One complication the data cannot address is non-starters. These are individuals who enroll in a class, but never actually start it. Studies conducted by Howell[45] contend that a large portion of non-completers are actually students who never submit any assignments nor take any tests (non-starters). The NETC data does not contain a variable

[45] S. Howell, D. Laws, and N. Lindsay, 2004.

that would identify non-starters. In this model, a non-completer is a sailor who did not withdraw from a course before the withdraw deadline and who received a failing grade or an incomplete for the course. The results of the model are summarized in Table 7 with the standard variable listed first and its DL interaction second.

Table 7. Individual Level Fixed Effects Results for Passing Rates

Dependent variable: Passed course	
Explanatory Variable	Coefficient (standard error)
	Enlisted Undergraduate
dumdl	-0.075
	(0.002)***
fy1996	-0.012
	(0.001)***
fy1997	-0.013
	(0.002)***
fy1998	-0.010
	(0.002)***
fy1999	-0.017
	(0.002)***
fy2000	-0.013
	(0.002)***
fy2001	-0.014
	(0.002)***
fy2002	-0.012
	(0.002)***
fy2003	-0.002
	(0.002)
fy2004	-0.001
	(0.002)
fy2005	-0.001
	(0.002)
fy2006	-0.001
	(0.002)
fy2007	0.001
	(0.002)
fy2008	0.003
	(0.003)
business	-0.007
	(0.001)***
dl_business	0.005
	(0.002)***
history	-0.011
	(0.001)***
dl_history	-0.027
	(0.002)***
math	-0.049
	(0.001)***
dl_math	-0.012
	(0.002)***

Dependent variable: Passed course	
Explanatory Variable	Coefficient (standard error)
natscience	-0.022
	(0.001)***
dl_natscience	-0.004
	(0.002)*
physcience	-0.050
	(0.002)***
dl_physcience	-0.013
	(0.004)***
infotech	-0.005
	(0.001)***
dl_infotech	0.010
	(0.002)***
english	-0.006
	(0.001)***
dl_english	-0.015
	(0.002)***
misc	-0.006
	(0.002)***
dl_misc	0.004
	(0.003)
medical	0.003
	(0.002)
dl_medical	0.002
	(0.003)
technical	0.002
	(0.001)
dl_technical	0.001
	(0.004)
nonrate	-0.026
	(0.002)***
dl_nonrate	-0.012
	(0.003)***
e4	-0.010
	(0.001)***
dl_e4	-0.012
	(0.002)***
e6	-0.000
	(0.001)
dl_e6	0.006
	(0.002)***
e7	-0.001
	(0.002)
dl_e7	0.023
	(0.002)***
e8	0.002
	(0.004)
dl_e8	0.030
	(0.004)***
e9	0.004
	(0.007)
dl_e9	0.028
	(0.007)***
Constant	0.943
	(0.002)***
Observations	1526036
Number of individuals	233459
R-squared	0.01

Standard errors in parentheses

Dependent variable: Passed course	
Explanatory Variable	Coefficient (standard error)
* significant at 10%; ** significant at 5%; *** significant at 1%	

DL has an overall negative effect on course completion (-8.3%), which is compounded by students being in lower paygrades and taking certain course subjects. The largest negative effect comes from physical sciences classes that have a lower than normal passing rate (-5.5% lower),which is more than doubled when taken as a DL course (12.5% lower). When paygrades E-5 and above utilize DL, the negative effect on passing rates is reduced, but not entirely eliminated. An explanation for the lower rate may be a product of not being able to distinguish non-starters from non-completers.

B. RESULTS OF TA PROGRAM PARTICIPATION MODEL ESTIMATES

The TA participation models analyze determinates of TA participation with a sample restricted to first term, enlisted sailors, with four-year contracts who survived at least the first three years of service (N=255,749). Unlike the summary statistics provided in Chapter IV, the results from the multivariate models isolate the effect of TA, while holding constant other observed characteristics. In addition, these models indicate whether the observed differences in Chapter IV are systematic or due to randomness. The marginal effects are displayed in Table 8 along with standard errors from the corresponding coefficients.

Similar to results found by Mehay and Pema (2009) female participation rates in TA were 15.5 percentage points

higher, nearly double, that of males. Additionally, females maintained a much higher participation rate in both DL and traditional models. Interestingly minorities, excluding Native Americans, were more likely to participate in TA of all types as compared to whites, all else held constant. The DL difference is largest for Hispanics who are 10% more likely to participate than whites, while both Hispanics and Asians are 32% more likely to participate in TA traditional classes. Sailors who were married during their first enlistment were 12.8% more likely to participate in DL classes than single sailors. Consistent with previous studies dealing with DL success and demands by family, having dependents had no significant impact on participation rates, but reduces the probability of participation in traditional classes by 11.3%. This result may be explained by the flexibility of DL in scheduling classes at times that suit the student's needs rather than at educational institution's schedules.

Although the effect of AFQT on participation rates in Table 8 is positive and significant, increases from the average score had very small effects on participation rates. Unlike Mehay and Pema (2009), this study finds all educational categories other than High school graduate accessions are less likely to participate in TA of all instruction types. The difference is largest for high school dropouts who are 17.9% less likely to participate in DL. Finally, the year dummies act as expected increasing each year coinciding with the rapid increase in use of DL after FY 2000. The increase could be partly due to measures by the military to make computers and internet access

available to every sailor, ship and shore, over the past decade coupled with the change to 100% coverage of tuition.

Table 8. Probit Model of Tuition Assistance Participation

Dependent variables: Overall, DL and Traditional Participation in TA						
	Overall TA		DL TA		Traditional TA	
	Coefficient (standard error)	Marginal Effect	Coefficient (standard error)	Marginal Effect	Coefficient (standard error)	Marginal Effect
female	0.588	0.155	0.461	0.032	0.560	0.131
	(0.008)***		(0.012)***		(0.008)***	
black	0.083	0.019	0.038	0.002	0.100	0.020
	(0.009)***		(0.014)***		(0.009)***	
native	-0.077	-0.016	-0.084	-0.004	-0.064	-0.012
	(0.019)***		(0.028)***		(0.020)***	
asian	0.177	0.042	0.038	0.002	0.199	0.042
	(0.014)***		(0.023)		(0.014)***	
hispanic	0.188	0.044	0.082	0.004	0.202	0.042
	(0.010)***		(0.017)***		(0.010)***	
unknown	0.148	0.035	0.113	0.006	0.184	0.039
	(0.038)***		(0.048)**		(0.040)***	
other	0.224	0.055	0.135	0.008	0.229	0.050
	(0.036)***		(0.052)***		(0.037)***	
married	0.090	0.020	0.103	0.005	0.076	0.015
	(0.009)***		(0.014)***		(0.009)***	
depend2	-0.064	-0.014	-0.010	-0.000	-0.077	-0.015
	(0.005)***		(0.007)		(0.005)***	
age	0.009	0.002	0.018	0.001	0.006	0.001
	(0.001)***		(0.002)***		(0.001)***	
afqt	0.008	0.002	0.010	0.000	0.007	0.001
	(0.000)***		(0.000)***		(0.000)***	
non_hs_dip	-0.119	-0.024	-0.153	-0.007	-0.107	-0.019
	(0.016)***		(0.026)***		(0.016)***	
ged	-0.072	-0.015	-0.100	-0.004	-0.064	-0.012
	(0.020)***		(0.031)***		(0.021)***	
some_col	-0.106	-0.022	-0.091	-0.004	-0.085	-0.015
	(0.016)***		(0.024)***		(0.017)***	
fy95	0.020	0.004	0.408	0.029	0.008	0.001
	(0.016)		(0.059)***		(0.017)	
fy96	-0.002	-0.000	0.669	0.058	-0.022	-0.004
	(0.016)		(0.056)***		(0.017)	
fy97	-0.040	-0.008	0.774	0.072	-0.062	-0.011
	(0.016)**		(0.055)***		(0.016)***	
fy98	0.047	0.010	0.942	0.099	0.007	0.001
	(0.016)***		(0.054)***		(0.016)	
fy99	0.024	0.005	1.019	0.112	-0.030	-0.006
	(0.016)		(0.054)***		(0.016)*	
fy00	0.064	0.014	1.212	0.151	-0.033	-0.006
	(0.016)***		(0.053)***		(0.016)**	
fy01	0.145	0.034	1.407	0.204	-0.002	-0.000
	(0.016)***		(0.053)***		(0.016)	
fy02	0.227	0.054	1.587	0.251	0.028	0.005
	(0.015)***		(0.053)***		(0.016)*	
fy03	0.250	0.060	1.665	0.276	0.020	0.004
	(0.015)***		(0.053)***		(0.016)	
Constant	-2.105		-4.251		-1.962	

	(0.030)***		(0.067)***		(0.032)***	
Observations	255749	255749	255749	255749	255749	255749

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

C. REENLISTMENT MODELS

In order to provide adequate observations for DL usage, two variables representing reenlistment were constructed. All reenlistment models estimate the effects of TA on the probability of reenlistment while controlling for race, gender, education, AFQT scores, marital status, number of dependents, year, and occupation dummies. Without occupational controls, differences in civilian job opportunities and occupational work demands coupled with higher selective reenlistment bonuses (SRB) for ratings with historically lower retention rates could pose potential biases for the model. Both sets of models are restricted to sailors who have completed at least 36 months of service (consistent with Buddin and Kapur(2005) and Mehay and Pema (2009)).

The results of the probit reenlistment models are listed in Tables 9 and 10. Additional models were estimated to measure the effect of TA classes taken during the first enlistment on the reenlistment plus extension decision. The sample size is thus restricted to 28,816, which is only 75% of the sample size for Mehay and Pema (2009). Additionally, the sample for the models using *reenlist2* (ISC coded) models are restricted to FY cohorts 1994-2001, while the sample for the models using *reenlist* (reenlistments and extensions) cover FY 1994-2003 and provide a larger sample both for DL and overall TA (40,669). Explanatory variables are the same in both models.

How the reenlistment variable is defined is crucial to the estimated effect of the TA variables. In the models where retention is based solely on reenlistment (*reenlist2),* in Table 9, TA variables follow conventional human capital theory and suggests that sailors are less likely to reenlist at the end of their tour by 9% (overall, 8% for DL). However, if the model captures both extensions and reenlistments (*reenlist* model), in Table 10, then the results are quite different. All TA variables in the *reenlist* retention models (Table 10) are significant and positive. Passing at least one TA course yields a 2% increase (1.5% for DL) on the probability of a sailor extending beyond the first 4 years of enlistment.

Neither model finds that females retain at different rates from men (consistent with Buddin and Kapur), but both models find that African-Americans have higher retention rates. Sailors who are married or have dependents are more likely to reenlist or extend their service beyond the first four years. In both models sailors entering with some college have the lowest probability of staying beyond four years.

Table 9. Probit Reenlistment(ISC) Models

	Dependent variable: *Reenlist2*			
	Overall TA		DL and Traditional TA	
	Coefficient (standard error)	Marginal Effect	Coefficient (standard error)	Marginal Effect
pass_some	-0.032	-0.012		
	(0.020)			
dl_some			-0.077	-0.028
			(0.025)***	
nondl_some			-0.040	-0.015
			(0.018)**	
female	0.017	0.006	0.019	0.007
	(0.017)		(0.017)	
black	0.187	0.070	0.186	0.070
	(0.021)***		(0.021)***	
native	0.066	0.025	0.066	0.024
	(0.051)		(0.051)	
asian	0.224	0.085	0.223	0.085
	(0.031)***		(0.031)***	
hispanic	0.083	0.031	0.083	0.031
	(0.023)***		(0.023)***	
other	0.013	0.005	0.013	0.005
	(0.089)		(0.089)	
married	0.098	0.036	0.099	0.037
	(0.021)***		(0.021)***	
depend2	0.132	0.049	0.132	0.049
	(0.011)***		(0.011)***	
age	0.008	0.003	0.008	0.003
	(0.003)***		(0.003)***	
afqt	-0.003	-0.001	-0.003	-0.001
	(0.001)***		(0.001)***	
non_hs_dip	0.017	0.006	0.015	0.005
	(0.040)		(0.040)	
ged	0.071	0.027	0.068	0.026
	(0.052)		(0.052)	
some_col	-0.082	-0.030	-0.082	-0.030
	(0.040)**		(0.040)**	
fy95	0.037	0.014	0.039	0.014
	(0.033)		(0.033)	
fy96	0.177	0.067	0.180	0.068
	(0.034)***		(0.034)***	
fy97	0.356	0.137	0.361	0.139
	(0.034)***		(0.034)***	
fy98	0.320	0.122	0.327	0.125
	(0.032)***		(0.033)***	
fy99	0.154	0.058	0.162	0.061
	(0.033)***		(0.033)***	
fy00	-0.068	-0.025	-0.058	-0.021
	(0.032)**		(0.033)*	
fy01	-0.404	-0.139	-0.392	-0.135
	(0.034)***		(0.034)***	
Constant	-0.665		-0.671	
	(0.074)***		(0.074)***	
Observations	29816	29816	29816	29816

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 10. Probit Reenlistment Models (includes Reenlistments and extensions)

	Dependent variable: *Reenlist*			
	Overall TA		DL and Traditional TA	
	Coefficient (standard error)	Marginal Effect	Coefficient (standard error)	Marginal Effect
pass_some	0.051	0.015		
	(0.019)***	(0.006)***		
dl_some			0.035	0.010
			(0.021)*	
nondl_some			0.044	0.013
			(0.017)***	
female	0.037	0.011	0.035	0.010
	(0.016)**		(0.016)**	
black	0.206	0.057	0.205	0.057
	(0.020)***		(0.020)***	
native	0.024	0.007	0.023	0.007
	(0.045)		(0.045)	
asian	0.202	0.055	0.202	0.055
	(0.033)***		(0.033)***	
hispanic	0.082	0.023	0.082	0.023
	(0.023)***		(0.023)***	
other	0.040	0.012	0.040	0.011
	(0.077)		(0.077)	
married	0.136	0.040	0.136	0.040
	(0.020)***		(0.020)***	
depend2	0.104	0.031	0.104	0.031
	(0.011)***		(0.011)***	
age	0.008	0.002	0.008	0.002
	(0.003)***		(0.003)***	
afqt	0.005	0.001	0.005	0.001
	(0.000)***		(0.000)***	
non_hs_dip	-0.019	-0.006	-0.019	-0.006
	(0.038)		(0.038)	
ged	-0.024	-0.007	-0.024	-0.007
	(0.047)		(0.047)	
some_col	-0.032	-0.010	-0.032	-0.010
	(0.037)		(0.037)	
fy95	0.117	0.033	0.117	0.033
	(0.036)***		(0.036)***	
fy96	0.134	0.037	0.133	0.037
	(0.036)***		(0.036)***	
fy97	0.316	0.083	0.315	0.083
	(0.037)***		(0.037)***	
fy98	0.423	0.107	0.422	0.107
	(0.036)***		(0.036)***	
fy99	0.531	0.129	0.529	0.129
	(0.036)***		(0.036)***	
fy00	0.460	0.115	0.458	0.115
	(0.035)***		(0.035)***	
fy01	0.315	0.083	0.313	0.083
	(0.035)***		(0.035)***	
fy02	0.456	0.116	0.454	0.115
	(0.034)***		(0.034)***	
fy03	0.391	0.102	0.389	0.101
	(0.034)***		(0.035)***	
Constant	-0.667		-0.659	
	(0.071)***		(0.071)***	

Dependent variable: *Reenlist*				
	Overall TA		DL and Traditional TA	
Observations	29816	29816	29816	29816
Standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%				

To test the assumption that specification of the control group plays a significant role in estimating TA effects, *reenlist* and *reenlist2* models were run on samples of all accessions with four year contracts. The results are listed in Appendix L. For both models the coefficient on TA indicates positive retention effects. The marginal effect in the *reenlist2* models is 14 percentage points and is 16.4 points in the *reenlist* model. This analysis shows that including sailors that attrited prior to 36 months biases the results upwards and distorts the true program effect.

In an effort to eliminate potential selection bias, the study compares TA-users who have successfully completed a TA course to other TA-users who were unable to complete a course due to exogenous reasons. The study assumes that sailors who sign up for TA have similar motivation, initiative, and aptitudes, and that not being able to complete a course was due to deployments, medical complications and other exogenous events. To test the assumption that restricting the sample to TA-users only reduces potential selection bias, both *reenlist2* and *reenlist* models were estimated with the full sample of four-year enlistees, and includes those who had not attrited before 36 months as a comparison to results from a TA-only sample. The results are listed in Appendix M and N for *reenlist2* and *reenlist,* respectively. The negative marginal effect of passing a course with TA for reenlistments is

reduced to 3.9% and the positive effect on reenlistments plus extensions is increased to 6.3%. A possible explanation for the results is that sailors who do not attrite before 36 months are similar to TA-users who have not attrited before 36 months.

Depending on the retention goal (reenlistment vs. service beyond the four-year contract) overall TA effects range from a negative 9%(8%:DL;5.3%Trad) to a positive 6.3%(1.3%:DL;4%Trad). This effect is much smaller than the 14.5% estimated in the model using the unrestricted samle. As expected, the results vary greatly depending on specification of the control group and the methodologies used to control for selection bias.

D. PROMOTION MODELS

Next, the study evaluates the effect of TA on promotion probabilities. If general education increases the productivity of recruits, then they would be more likely to promote to higher paygrades. For this, multivariate probit promotion models were estimated with the same core explanatory variables as the retention models. The sample is again restricted to four-year enlistees who completed at least 36 months of service to ensure the sailors in the sample had adequate time to utilize TA. The dependent variables are promotion to E-4 and E-5.

The results of the E-4 promotion models are presented in Table 11. Significant positive effects were found for both successful DL and traditional TA-users. DL usage had a slightly higher effect on the probability of promoting to E-4 (4.2%) than traditional(3.9%). Appendix O presents the E4

promotion probit model estimated on the full sample which finds that both DL and traditional usage increases promotion by 6.7%. As with the reenlistment model, potential selection bias is eliminated by using a natural control group. Promotion to E-4 is highly dependent on the performance of individual sailors, thus the results likely indicate positive effects of education on performance.

The model finds that females are slightly less likely to promote to E-4 (1.7%) along with African Americans and Hispanics. Married sailors and those with dependents promote at higher rates than single sailors. High school dropouts and GED holders are 2.8% less likely to promote than high diploma holders.

Table 11. Probit Promote to E4 Model

	Dependent variable: Promote to E4			
	Overall TA		DL and Traditional TA	
	Coefficient (standard error)	Marginal Effect	Coefficient (standard error)	Marginal Effect
pass_some	0.291 (0.024)***	0.044		
dl_some			0.351 (0.033)***	0.038
nondl_some			0.253 (0.023)***	0.035
female	-0.112 (0.021)***	-0.015	-0.121 (0.021)***	-0.016
black	-0.217 (0.026)***	-0.031	-0.218 (0.026)***	-0.031
native	-0.001 (0.068)	-0.000	0.003 (0.069)	0.000
asian	0.094 (0.042)**	0.012	0.096 (0.043)**	0.012
hispanic	-0.007 (0.031)	-0.001	-0.007 (0.031)	-0.001
other	0.013 (0.105)	0.002	0.009 (0.105)	0.001
married	0.053 (0.026)**	0.007	0.051 (0.027)*	0.007
depend2	0.009 (0.015)	0.001	0.008 (0.015)	0.001 (0.002)
age	0.019 (0.004)***	0.002	0.019 (0.004)***	0.002
afqt	0.018	0.002	0.017	0.002

Dependent variable: Promote to E4				
	Overall TA		DL and Traditional TA	
	Coefficient (standard error)	Marginal Effect	Coefficient (standard error)	Marginal Effect
	(0.001)***		(0.001)***	
non_hs_dip	-0.185	-0.027	-0.179	-0.026
	(0.050)***		(0.050)***	
ged	-0.164	-0.024	-0.162	-0.023
	(0.068)**		(0.068)**	
some_col	0.089	0.011	0.088	0.011
	(0.058)		(0.058)	
fy95	0.103	0.013	0.099	0.012
	(0.045)**		(0.045)**	
fy96	0.330	0.035	0.322	0.034
	(0.049)***		(0.049)***	
fy97	0.630	0.055	0.616	0.054
	(0.054)***		(0.054)***	
fy98	0.587	0.054	0.570	0.052
	(0.049)***		(0.049)***	
fy99	0.470	0.046	0.447	0.044
	(0.048)***		(0.048)***	
fy00	0.343	0.037	0.315	0.034
	(0.045)***		(0.045)***	
fy01	0.267	0.030	0.233	0.026
	(0.045)***		(0.045)***	
fy02	0.271	0.030	0.226	0.026
	(0.044)***		(0.044)***	
fy03	0.211	0.025	0.155	0.018
	(0.044)***		(0.045)***	
Constant	-0.631		-0.577	
	(0.101)***		(0.101)***	
Observations	33984	33984	33984	33984
Standard errors in parentheses				
* significant at 10%; ** significant at 5%; *** significant at 1%				

Finally, the effects of TA on promotion to E-5 are estimated. As with the models for promotion to E-4, separate models are estimated to obtain the effect of TA and TA by method of instruction. Results are listed in Table 12. Successfully completing at least one traditional TA course has a positive effect on promotion to E-5 (4.9 points or 17%). Interestingly, the effect of DL on E-5 promotion is stronger (about 7.3 points or 29%) than traditional TA usage. Both effects are significantly lower

than in the full sample (Appendix P) where the DL effect was estimated at 35% and traditional at 26%, again reaffirming the need for choosing the correct control group.

Consistent with Mehay and Pema (2009), females and all minorities are less likely to promote to E-5. Married sailors continue to promote at rates higher than single sailors. However, it appears that education plays a larger role, with high school dropouts and GED holders 14.4% less likely to promote than high school diploma holders.

Table 12. Probit Promote to E5 Model

Dependent variable: Promote to E5				
	Overall TA		DL and Traditional TA	
	Coefficient (standard error)	Marginal Effect	Coefficient (standard error)	Marginal Effect
pass_some	0.223	0.053		
	(0.028)***	(0.006)***		
dl_some			0.267	0.073
			(0.028)***	
nondl_some			0.173	0.043
			(0.025)***	
female	-0.095	-0.024	-0.106	-0.027
	(0.023)***		(0.023)***	
black	-0.148	-0.036	-0.149	-0.036
	(0.031)***		(0.031)***	
native	-0.074	-0.018	-0.073	-0.018
	(0.060)		(0.060)	
asian	-0.037	-0.009	-0.032	-0.008
	(0.048)		(0.048)	
hispanic	-0.061	-0.015	-0.061	-0.015
	(0.033)*		(0.033)*	
other	-0.198	-0.046	-0.209	-0.048
	(0.120)		(0.121)*	
married	0.008	0.002	0.004	0.001
	(0.028)		(0.029)	
depend2	0.042	0.011	0.040	0.010
	(0.015)***		(0.015)***	
age	0.032	0.008	0.031	0.008
	(0.004)***		(0.004)***	
afqt	0.021	0.005	0.021	0.005
	(0.001)***		(0.001)***	
non_hs_dip	-0.157	-0.037	-0.154	-0.037
	(0.058)***		(0.058)***	
ged	-0.155	-0.037	-0.150	-0.036
	(0.069)**		(0.069)**	
some_col	0.174	0.048	0.178	0.049
	(0.048)***		(0.048)***	
fy95	0.133	0.036	0.125	0.034

Dependent variable: Promote to E5				
	Overall TA		DL and Traditional TA	
	Coefficient (standard error)	Marginal Effect	Coefficient (standard error)	Marginal Effect
	(0.060)**		(0.060)**	
fy96	0.336	0.097	0.320	0.092
	(0.060)***		(0.060)***	
fy97	0.580	0.180	0.559	0.172
	(0.060)***		(0.060)***	
fy98	0.820	0.266	0.792	0.255
	(0.056)***		(0.056)***	
fy99	0.909	0.299	0.880	0.288
	(0.055)***		(0.056)***	
fy00	0.914	0.300	0.876	0.285
	(0.055)***		(0.055)***	
fy01	0.855	0.278	0.808	0.260
	(0.055)***		(0.055)***	
fy02	0.761	0.241	0.705	0.220
	(0.054)***		(0.055)***	
fy03	0.682	0.212	0.617	0.189
	(0.054)***		(0.056)***	
Constant	-3.628		-3.542	
	(0.105)***		(0.105)***	
Observations	22937	22937	22937	22937
Standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%				

E. DISTANCE LEARNING BASELINE

In the earlier models the DL variable has represented the effect of passing a DL course while holding constant passing a traditional course using TA. This section provides estimates of the DL variable effects on retention and promotion in samples of TA-users who only use DL.

Successfully passing a DL course using the Navy’s TA program increases the likelihood of retention by 3.3%, when the decision includes extensions. The results are listed in Table 13. DL-usage was not found to be statistically significant when retention is defined as reenlistment only. This effect is likely due to the reduced observations from restricting the sample to observations before FY 2002.

Table 13. Probit models for Retention with DL-users only

	Dependent variables: *Reenlist2, Reenlist*			
	DL on Reenlist2 w/ DL-users only		DL on Reenlist w/ DL-users only	
	Coefficient (standard error)	Marginal Effect	Coefficient (standard error)	Marginal Effect
dl_some	0.021	0.007	0.073	0.024
	(0.058)		(0.041)*	
female	-0.066	-0.023	-0.120	-0.039
	(0.060)		(0.041)***	
black	0.123	0.044	0.211	0.065
	(0.076)		(0.053)***	
native	-0.037	-0.013	-0.092	-0.031
	(0.157)		(0.099)	
asian	-0.050	-0.017	0.190	0.058
	(0.136)		(0.096)**	
hispanic	0.112	0.040	0.035	0.011
	(0.084)		(0.064)	
unknown	-0.299	-0.096	-0.067	-0.022
	(0.347)		(0.164)	
other	1.370	0.501	0.409	0.113
	(0.366)***		(0.201)**	
married	0.153	0.054	0.029	0.009
	(0.072)**		(0.049)	
depend2	0.122	0.043	0.158	0.051
	(0.035)***		(0.026)***	
age	-0.005	-0.002	-0.013	-0.004
	(0.010)		(0.006)**	
afqt	-0.003	-0.001	0.006	0.002
	(0.002)*		(0.001)***	
non_hs_dip	0.253	0.093	-0.008	-0.003
	(0.126)**		(0.096)	
ged	0.283	0.105	0.083	0.026
	(0.166)*		(0.115)	
some_col	0.067	0.024	-0.041	-0.013
	(0.129)		(0.085)	
fy95	-0.071	-0.024	-0.109	-0.036
	(0.364)		(0.388)	
fy96	0.200	0.073	-0.080	-0.026
	(0.341)		(0.366)	
fy97	0.013	0.004	-0.224	-0.077
	(0.338)		(0.362)	
fy98	0.063	0.022	0.029	0.009
	(0.333)		(0.359)	
fy99	-0.101	-0.035	0.103	0.032
	(0.330)		(0.356)	
fy00	-0.278	-0.093	0.162	0.050
	(0.328)		(0.353)	
fy01	-0.561	-0.186	-0.022	-0.007
	(0.326)*		(0.351)	
fy02			0.069	0.022
			(0.350)	
fy03			-0.056	-0.018
			(0.350)	
Constant	-0.217		0.060	
	(0.397)		(0.381)	
Observations	2611	2611	5856	5856

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Successful DL usage was found to increase the probability of promoting to both E-4 and E-5 by 5.8% and 22%, respectively, as seen in Table 14. To correct the estimates for self-selection, the DL only models restricted the sample to TA-users who only use DL. To demonstrate the significance of this restriction the models were also estimated with all TA-users. When the sample is expanded to all TA-users the effect of the DL variable is increased by .5% for retention, 1.5% for promotion to E4, and 2% for promotion to E5. The difference in estimates indicates there may be some differences in unobserved factors between sailors that choose to use DL only and other TA-users. The results of DL models with all TA-user samples are listed in Appendixes R and S.

Table 14. Probit Models for Promote to E4 and E5 w/ DL-users only

Dependent variable: Promote E4 & Promote E5				
	DL on Promote E4 w/ DL-users only		DL on Promote E5 w/ DL-users only	
	Coefficient (standard error)	Marginal Effect	Coefficient (standard error)	Marginal Effect
dl_some	0.348 (0.059)***	0.052	0.235 (0.059)***	0.078
female	-0.224 (0.059)***	-0.032	-0.156 (0.058)***	-0.052
black	-0.098 (0.072)	-0.014	-0.024 (0.076)	-0.008
native	-0.054 (0.158)	-0.008	-0.081 (0.133)	-0.027
asian	0.027 (0.137)	0.004	0.073 (0.133)	0.026
hispanic	0.267 (0.106)**	0.031	0.051 (0.087)	0.018
unknown	0.024 (0.223)	0.003	-0.529 (0.279)*	-0.151
other	0.190 (0.266)	0.022	0.254 (0.253)	0.092
married	-0.038 (0.074)	-0.005	0.010 (0.070)	0.004
depend2	0.091 (0.040)**	0.012	0.044 (0.034)	0.015
age	0.023 (0.011)**	0.003	0.030 (0.008)***	0.010

afqt	0.017	0.002	0.020	0.007
	(0.002)***		(0.002)***	
non_hs_dip	-0.079	-0.011	-0.228	-0.073
	(0.136)		(0.141)	
ged	-0.170	-0.026	0.066	0.023
	(0.172)		(0.156)	
some_col	-0.086	-0.012	0.184	0.066
	(0.138)		(0.110)*	
fy95	-0.149	-0.022	6.102	0.734
	(0.517)		(0.320)***	
fy96	0.390	0.040	5.574	0.754
	(0.498)		(0.282)***	
fy97	0.262	0.029	6.288	0.767
	(0.488)		(0.252)***	
fy98	0.628	0.055	6.388	0.800
	(0.487)		(0.237)***	
fy99	0.121	0.015	6.429	0.837
	(0.466)		(0.228)***	
fy00	0.213	0.025	6.380	0.903
	(0.462)		(0.223)***	
fy01	0.087	0.011	6.227	0.946
	(0.458)		(0.218)***	
fy02	-0.009	-0.001	6.269	0.983
	(0.456)		(0.217)***	
fy03	-0.152	-0.021	6.121	0.989
	(0.454)		(0.217)***	
Constant	-0.649		-9.149	
	(0.517)		(0.000)	
Observations	4433	4433	3334	3334

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

THIS PAGE INTENTIONALLY LEFT BLANK

VI. CONCLUSIONS & RECOMMENDATIONS

A. CONCLUSIONS

This thesis analyzes the effects of participating in the Navy's TA program and method of instruction on the retention and performance of new accessions. Additionally, the study analyzes whether the observed differences in passing rates between traditional and DL classes are due to the method of instruction or unobserved characteristics of individuals who take DL versus those who choose traditional classes.

The effect of TA-use depends on the definition of retention. When retention is defined as reenlistment only the analysis indicates that TA-use decreases the likelihood of reenlistment by 9%. When separating the effect by method of instruction DL has a greater negative effect on reenlistment than traditional TA use. The mean reenlistment rate for all four-year contracts was 38% while the rate for TA-users was 35%.

When the definition of retention includes extensions, TA-use increases retention by 5.1 percentage points (2%). The effect of method of instruction is not significantly different between DL and traditional-type courses. The mean retention rate for TA-users was 78%. Successful completion of courses is likely affected by ability, therefore all models included AFQT scores to mitigate upward ability bias.

TA users are more likely to promote to both E-4 and E-5 before the end of their fourth year of service than non-users. Successful DL course completion has a larger

positive effect on promotions to both E-4 and E-5 than traditional use. The largest benefit is found for DL users in promoting to E-5, where the DL effect is nearly twice the effect of traditional classes (29% versus 17%).

The study also indicates that DL has a negative effect on the likelihood that a student will pass their TA funded course (about 8% lower). This effect is compounded by lower-rank and by the choice of certain courses, such as English, Math or Sciences. The negative effect is partially reduced when more senior ranks take DL courses. Some of the negative effect may be due in part to “non-starters”, but this cannot be accounted for with the current NETC data. Additionally, DL-users are more likely to have heavier work demands than traditional students. This effect is partially accounted for by occupation, but does not account for classes that may have been chosen due to deployments or other situations where service members have higher workloads and traditional courses are unavailable.

The Navy’s TA program contributes to the human capital of the sailors. Although the thesis finds the result of increased worker mobility to be lower reenlistment rates, sailors who successfully complete at least one TA-reimbursed course of any type are more likely to serve past their initial four-year obligation. This allows a longer time for the Navy to recoup firm-specific training investments without the added cost of selective reenlistment bonuses.

The models clearly indicate positive returns to TA, especially for DL, in the performance of sailors. This positive impact should be included with the un-monetized benefits gained when TA is used as a recruiting incentive.

Additionally, TA serves as a diversity tool, as females and minorities are frequent users of TA increasing their likelihood of promotion.

B. RECOMMENDATIONS

DL use is rapidly growing in both the Navy and in civilian institutions.[46] Although the thesis found negative effects for DL on passing rates, the effect is reduced when DL courses are taken by senior recruits. This is consistent with civilian studies that find successful DL students to be more mature, career oriented, and likely to have heavier workloads. Lower numbers may also be exacerbated by "non-starters". As cited in previous studies[47] a recent Navy education quick poll (2006) found that the clear majority of E-2s to E-7s agreed with the statement "Educational Opportunities in the Navy Positively Impact My Decision to Make the Navy a Career."[48] Additionally, 78% to 83% in paygrades E-2 to E-5 reported "not easy to schedule courses." The most common reasons cited for difficulties in scheduling classes were a "lack of time" and "conflicts between work and education." These findings are consistent with civilian studies for DL students, who cite work demands as the main obstacle in successfully completing courses.

To combat these deficiencies, command awareness of service members who take courses outside of normal working hours, along with mentorship programs that build strong

---

[46] E. Allen, and J. Seaman, 2007. Online Nation, Five Years of Growth in Online Learning. *The Sloan Consortium.*

[47] S. Mehay and E. Pema 2009.

[48] Z. Uriell, G. Patrissi, C. Newell and K. Whittam, 2006. Navy quick poll: Enlisted education, navy personnel, research, studies, & technology(NPRST): Millington, TN.

study habits and stress course completion, may mitigate the lower passing rates. With the unique challenges and opportunities provided by service in the Navy, flexible educational opportunities will continue to be needed in order to fulfill both training and educational requirements for tomorrow’s sailors.

The following are recommendations for further research. A follow-on study focusing on the costs associated with providing traditional class opportunities versus the costs of lower passing rates by DL students may provide answers to the cost effectiveness of DL. Subsequent studies should include more recent cohorts as DL grew rapidly from FY 2000 to 2007 surpassing traditional classes as the most commonly used form of TA in 2006 and may be having alternative affects on cohorts after FY 2003. Finally, obtaining data to augment TA information with deployment periods may more fully isolate the effect of DL on passing rates.

APPENDIX A. TA COURSES TAKEN BY FY

Tuition Assistance Courses Taken By Year			
	Overall	Traditional	DL
1995	102712	102668	44
1996	90129	90060	69
1997	93578	92397	1181
1998	100363	96838	3525
1999	101241	95509	5732
2000	105571	97355	8216
2001	106888	94550	12338
2002	112002	91980	20022
2003	112971	82756	30215
2004	131483	84161	47322
2005	143021	82767	60254
2006	153731	78569	75162
2007	151334	68953	82381
2008	136716	56283	80433

*NETC TA data from NCMIS database files for active duty enlisted sailors taking undergraduate level courses

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX B. ACTIVE DUTY PERSONNEL BY RANK AND YEAR

Total Active Duty Personnel by Rank and Year

Rank	1995	1996	1997	1998	1999	2000	2001
E1	23,769	22,426	19,944	21,416	19,186	22,164	20,141
E2	31,175	29,159	26,307	24,302	22,911	19,434	24,320
E3	57,210	58,300	54,494	50,437	46,043	52,564	50,604
E4	78,521	73,935	68,157	63,071	63,049	63,183	63,910
E5	85,771	79,941	75,905	72,063	68,380	67,448	68,591
E6	69,097	64,776	61,970	58,256	55,100	54,113	52,945
E7	28,667	26,662	26,534	25,081	23,480	22,494	22,560
E8	8,350	7,940	7,283	7,135	6,121	5,954	6,128
E9	3,596	3,115	3,121	3,067	2,909	2,918	2,887
Total	386,156	366,254	343,715	324,828	307,179	310,272	312,086

Rank	2002	2003	2004	2005	2006	2007
E1	18,915	13,190	11,817	11,682	15,841	14,090
E2	24,898	22,407	20,024	17,808	15,358	17,009
E3	53,024	56,299	57,264	58,210	53,788	51,128
E4	66,949	67,742	65,495	59,022	57,328	52,683
E5	71,843	75,026	74,910	73,261	70,697	67,780
E6	53,084	54,028	53,767	54,318	52,773	49,456
E7	23,610	23,969	24,184	23,465	22,731	23,697
E8	6,670	6,897	6,896	6,738	7,092	6,607
E9	3,176	3,191	3,125	3,035	2,855	2,801
Total	322,169	322,749	317,482	307,539	298,463	285,251

Source: Defense Manpower Data Center enlisted master file. Annual numbers derived from first quarter of respective Fiscal Year.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX C. TA PARTICIPATION RATES BY FY

Tuition Assistance Participation Rates By Year			
	Overall	Traditional	DL
1995	9.0%	8.9%	0.0%
1996	8.9%	8.9%	0.0%
1997	9.8%	9.7%	0.3%
1998	9.9%	9.6%	0.7%
1999	10.1%	9.6%	1.1%
2000	10.3%	9.5%	1.4%
2001	10.3%	9.0%	1.8%
2002	10.6%	8.9%	2.7%
2003	13.4%	10.1%	4.6%
2004	15.2%	9.9%	6.9%
2005	16.9%	9.9%	8.9%
2006	17.8%	9.4%	10.7%
2007	18.0%	8.6%	11.7%

*NETC TA data from NCMIS database files for active duty enlisted sailors participating by method of instruction divided by active duty enlisted strengths per year. DL + Traditional rates can be greater than Overall as some sailors participate in both DL and traditional courses in the same year.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX D. DISTRIBUTION OF TA COURSES BY RANK

Overall Distribution of TA Courses by Rank and Year

Rank	1995	1996	1997	1998	1999	2000	2001
E1	840	677	477	372	745	501	509
E2	3118	2874	2562	2031	2500	2805	2066
E3	9238	9721	9769	8654	8608	9064	8928
E4	20024	17649	18271	19641	20057	20047	20569
E5	30438	25837	26609	29672	30133	31358	32411
E6	24781	21071	22010	23661	22896	24732	24758
E7	10877	9294	10401	12084	12229	12629	13224
E8	2725	2460	2759	3415	3154	3293	3276
E9	671	546	720	833	919	1142	1147
Total	102712	90129	93578	100363	101241	105571	106888

Rank	2002	2003	2004	2005	2006	2007
E1	420	403	410	519	675	714
E2	1841	2087	1862	1917	2240	2838
E3	8941	10742	11936	11679	11382	11832
E4	21230	20035	22272	21382	22497	22528
E5	35386	36347	42746	46467	48558	47921
E6	25515	26369	33083	39606	42581	39861
E7	13702	12258	13841	15674	18581	18658
E8	3683	3505	4002	4401	5582	5308
E9	1284	1225	1331	1377	1535	1674
Total	112002	112971	131483	143022	153631	151334

Source: NETC TA data from NCMIS database files for active duty enlisted sailors taking undergraduate level courses

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX E. ACTIVE DUTY FORCE STRENGTH BY RANK

Active Duty Force Strength by Rank and year

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
E1	23,769	22,426	19,944	21,416	19,186	22,164	20,141	18,915	13,190	11,817	11,682	15,841	14,090
E2	31,175	29,159	26,307	24,302	22,911	19,434	24,320	24,898	22,407	20,024	17,808	15,358	17,009
E3	57,210	58,300	54,494	50,437	46,043	52,564	50,604	53,024	56,299	57,264	58,210	53,788	51,128
E4	78,521	73,935	68,157	63,071	63,049	63,183	63,910	66,949	67,742	65,495	59,022	57,328	52,683
E5	85,771	79,941	75,905	72,063	68,380	67,448	68,591	71,843	75,026	74,910	73,261	70,697	67,780
E6	69,097	64,776	61,970	58,256	55,100	54,113	52,945	53,084	54,028	53,767	54,318	52,773	49,456
E7	28,667	26,662	26,534	25,081	23,480	22,494	22,560	23,610	23,969	24,184	23,465	22,731	23,697
E8	8,350	7,940	7,283	7,135	6,121	5,954	6,128	6,670	6,897	6,896	6,738	7,092	6,607
E9	3,596	3,115	3,121	3,067	2,909	2,918	2,887	3,176	3,191	3,125	3,035	2,855	2,801

Traditional Participant Numbers By Rank and Year

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
E1	560	421	340	236	430	296	304	237	240	234	242	297	272
E2	1,787	1,640	1,458	1,114	1,313	1,360	1,062	944	1,043	898	832	863	924
E3	4,289	4,498	4,532	3,803	3,500	3,635	3,584	3,411	4,443	4,410	3,917	3,360	3,099
E4	7,437	7,071	7,324	7,057	6,526	6,601	6,527	6,353	6,722	6,284	5,519	5,296	4,569
E5	9,861	9,049	9,345	8,896	8,283	8,591	8,622	8,921	10,270	10,316	10,088	9,141	7,940
E6	7,884	7,370	7,547	7,043	6,402	6,789	6,385	6,177	6,878	6,702	6,970	6,472	5,301
E7	3,310	3,009	3,304	3,377	3,159	3,121	3,122	3,081	3,094	2,838	2,728	2,587	2,283
E8	855	872	892	923	807	794	826	780	889	803	781	772	645
E9	230	206	250	267	247	303	287	308	298	287	251	209	185

Traditional Participation Rates by Rank and Year

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
E1	2.356%	1.877%	1.705%	1.102%	2.241%	1.335%	1.509%	1.253%	1.820%	1.980%	2.072%	1.875%	1.930%
E2	5.732%	5.624%	5.542%	4.584%	5.731%	6.998%	4.367%	3.791%	4.655%	4.485%	4.672%	5.619%	5.432%
E3	7.497%	7.715%	8.317%	7.540%	7.602%	6.915%	7.082%	6.433%	7.892%	7.701%	6.729%	6.247%	6.061%
E4	9.471%	9.564%	10.746%	11.189%	10.351%	10.447%	10.213%	9.489%	9.923%	9.595%	9.351%	9.238%	8.673%
E5	11.497%	11.320%	12.311%	12.345%	12.113%	12.737%	12.570%	12.417%	13.689%	13.771%	13.770%	12.930%	11.714%
E6	11.410%	11.378%	12.178%	12.090%	11.619%	12.546%	12.060%	11.636%	12.730%	12.465%	12.832%	12.264%	10.719%
E7	11.546%	11.286%	12.452%	13.464%	13.454%	13.875%	13.839%	13.050%	12.908%	11.735%	11.626%	11.381%	9.634%
E8	10.240%	10.982%	12.248%	12.936%	13.184%	13.336%	13.479%	11.694%	12.890%	11.644%	11.591%	10.886%	9.762%
E9	6.396%	6.613%	8.010%	8.706%	8.491%	10.384%	9.941%	9.698%	9.339%	9.184%	8.270%	7.320%	6.605%

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX F. DL PARTICIPATION NUMBERS AND RATES

Active Duty Force Strength by Rank and year

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
E1	23,769	22,426	19,944	21,416	19,186	22,164	20,141	18,915	13,190	11,817	11,682	15,841	14,090
E2	31,175	29,159	26,307	24,302	22,911	19,434	24,320	24,898	22,407	20,024	17,808	15,358	17,009
E3	57,210	58,300	54,494	50,437	46,043	52,564	50,604	53,024	56,299	57,264	58,210	53,788	51,128
E4	78,521	73,935	68,157	63,071	63,049	63,183	63,910	66,949	67,742	65,495	59,022	57,328	52,683
E5	85,771	79,941	75,905	72,063	68,380	67,448	68,591	71,843	75,026	74,910	73,261	70,697	67,780
E6	69,097	64,776	61,970	58,256	55,100	54,113	52,945	53,084	54,028	53,767	54,318	52,773	49,456
E7	28,667	26,662	26,534	25,081	23,480	22,494	22,560	23,610	23,969	24,184	23,465	22,731	23,697
E8	8,350	7,940	7,283	7,135	6,121	5,954	6,128	6,670	6,897	6,896	6,738	7,092	6,607
E9	3,596	3,115	3,121	3,067	2,909	2,918	2,887	3,176	3,191	3,125	3,035	2,855	2,801

DL Participant Numbers By Rank and Year

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
E1	0	0	1	4	29	23	14	30	33	40	80	130	161
E2	1	2	19	43	106	130	90	99	217	248	332	441	663
E3	4	10	64	186	299	333	386	515	1,071	1,773	2,205	2,309	2,618
E4	10	11	173	393	626	764	1,000	1,489	2,467	3,660	4,135	4,814	4,979
E5	6	9	249	631	949	1,259	1,722	2,712	4,638	6,680	8,397	9,639	10,323
E6	9	6	260	540	788	1,208	1,466	2,279	3,832	5,682	7,540	9,048	9,126
E7	1	2	130	303	472	598	830	1,220	2,069	2,989	3,804	4,716	4,768
E8	1	1	33	92	124	153	232	339	596	911	1,113	1,340	1,389
E9	0	0	4	20	37	56	84	134	226	304	360	406	430

DL Participation Rates by Rank and Year

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
E1	0.000%	0.000%	0.005%	0.019%	0.151%	0.104%	0.070%	0.159%	0.250%	0.338%	0.685%	0.821%	1.143%
E2	0.003%	0.007%	0.072%	0.177%	0.463%	0.669%	0.370%	0.398%	0.968%	1.239%	1.864%	2.871%	3.898%
E3	0.007%	0.017%	0.117%	0.369%	0.649%	0.634%	0.763%	0.971%	1.902%	3.096%	3.788%	4.293%	5.120%
E4	0.013%	0.015%	0.254%	0.623%	0.993%	1.209%	1.565%	2.224%	3.642%	5.588%	7.006%	8.397%	9.451%
E5	0.007%	0.011%	0.328%	0.876%	1.388%	1.867%	2.511%	3.775%	6.182%	8.917%	11.462%	13.634%	15.230%
E6	0.013%	0.009%	0.420%	0.927%	1.430%	2.232%	2.769%	4.293%	7.093%	10.568%	13.881%	17.145%	18.453%
E7	0.003%	0.008%	0.490%	1.208%	2.010%	2.658%	3.679%	5.167%	8.632%	12.359%	16.211%	20.747%	20.121%
E8	0.012%	0.013%	0.453%	1.289%	2.026%	2.570%	3.786%	5.082%	8.641%	13.211%	16.518%	18.895%	21.023%
E9	0.000%	0.000%	0.128%	0.652%	1.272%	1.919%	2.910%	4.219%	7.082%	9.728%	11.862%	14.221%	15.352%

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX G. ACTIVE DUTY ENLISTED GENDER COMPOSITION

	Active Duty Enlisted Force Gender Composition												
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Female	44,619	44,345	42,041	40,747	39,736	41,306	43,012	45,944	46,529	45,709	43,782	42,533	40,883
Male	341,537	321,940	301,675	284,084	268,834	268,976	269,089	276,278	276,220	271,774	263,760	255,937	244,372
Total	386,156	366,285	343,716	324,831	308,570	310,282	312,101	322,222	322,749	317,483	307,542	298,470	285,255
	Active Duty Enlisted Overall TA Participation by Gender												
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Female	8,065	8,197	8,488	7,649	7,163	7,486	7,903	8,873	11,406	12,569	13,073	13,024	12,624
Male	26,513	24,415	25,303	24,523	23,928	24,354	24,255	25,242	31,895	35,674	38,896	40,220	38,773
Total	34,578	32,612	33,791	32,172	31,091	31,840	32,158	34,115	43,301	48,243	51,969	53,244	51,397
	Active Duty Enlisted Overall TA Usage by Gender												
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Female	21824	20908	22308	22270	21889	23819	25071	27915	29102	32817	34683	37058	37237
Male	80888	69221	71270	78093	79352	81752	81817	84087	83869	98666	108338	116673	114097
Total	102712	90129	93578	100363	101241	105571	106888	112002	112971	131483	143021	153731	151334
	Active Duty Enlisted Overall TA Avg Courses Per Student by Gender												
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Female	2.71	2.55	2.63	2.91	3.06	3.18	3.17	3.15	2.55	2.61	2.65	2.85	2.95
Male	3.05	2.84	2.82	3.18	3.32	3.36	3.37	3.33	2.63	2.77	2.79	2.90	2.94
	Active Duty Enlisted DL TA Participation by Gender												
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Female	3	10	220	478	737	1,035	1,468	2,292	4,030	5,756	7,006	7,839	8,355
Male	29	31	700	1,691	2,637	3,376	4,224	6,311	10,744	16,023	20,346	24,051	25,127
	Active Duty Enlisted Traditional TA Participation by Gender												
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Female	8,063	8,194	8,385	7,424	6,833	6,985	6,144	7,565	8,710	8,495	7,829	7,133	6,195
Male	26,489	24,393	24,922	23,679	22,589	22,579	21,939	21,241	23,880	23,086	22,543	20,838	18,195

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX H. ACTIVE DUTY ENLISTED RACE COMPOSITION

Active Duty Enlisted Race Composition

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
White	263288	244813	224974	207748	192703	189779	185997	188926	166072	184742	178569	167479	149765
Black	70750	68945	66202	63861	61886	62988	64748	67351	60575	66557	64148	61034	56266
Native	2021	2136	2476	3198	4059	5378	6435	7198	6326	9325	11355	13052	14799
Asian	14490	15140	15744	16289	16888	17645	18243	19033	17725	19605	19705	19295	18447
Hispanic	28415	28960	28567	28554	28318	29631	31689	34380	30932	31232	27349	31731	41183

Active Duty Enlisted Overall Participation By Race

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
White	21,832	20,272	20,427	19,027	17,589	17,323	16,939	17,506	22,230	25,229	26,960	27,326	25,731
Black	6,001	5,928	6,384	6,307	6,397	6,913	7,353	7,695	9,836	10,646	11,724	12,179	11,949
Native	141	134	171	180	240	308	394	492	653	898	1,096	1,268	1,479
Asian	1,322	1,391	1,528	1,587	1,720	1,848	1,927	2,000	2,550	2,899	3,160	3,288	3,216
Hispanic	2,742	2,804	3,025	2,911	2,959	3,231	3,361	3,864	4,854	5,366	5,360	5,383	5,384

Active Duty Enlisted DL Participation By Race

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
White	14	17	639	1,469	2,187	2,658	3,381	4,950	8,373	12,373	14,899	17,077	17,476
Black	1	8	120	331	572	854	1,179	1,766	3,114	4,419	6,044	7,211	7,656
Native	0	0	4	14	24	46	77	107	216	415	527	679	912
Asian	1	1	32	89	145	205	277	397	683	1,109	1,431	1,719	1,916
Hispanic	2	3	74	162	248	404	486	776	1,348	2,049	2,515	2,970	3,239

Active Duty Enlisted Traditional Participation By Race

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
White	21,823	20,261	20,094	18,285	16,486	15,882	15,060	14,349	15,963	15,488	14,869	13,422	11,312
Black	6,000	5,926	6,324	6,151	6,126	6,508	6,746	6,669	7,689	7,430	7,187	6,688	5,948
Native	141	134	168	173	224	283	343	418	496	573	676	734	747
Asian	1,321	1,390	1,505	1,548	1,650	1,751	1,786	1,793	2,107	2,092	2,050	1,968	1,697
Hispanic	2,740	2,803	2,983	2,830	2,834	3,035	3,115	3,401	3,911	3,870	3,444	3,144	2,879

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX I. TA DISTRIBUTION BY COURSE TYPE

Overall Distribution By Course Type

	Business	History	Math	Nat Sci	Phy Sci	Info Tech	Hummanit	English	No Cat	Medical	Techincal	Law
1995	14209	6747	9628	8298	3169	11545	21206	11939	3224	2872	5407	4568
1996	11875	6018	8251	7271	2751	10473	18689	10579	2784	2804	4646	3988
1997	12451	6011	8266	7649	2723	10979	19205	11261	2750	3076	5193	4014
1998	14070	5941	8339	8161	3069	12773	20265	11206	2933	3205	6057	4344
1999	14739	5401	8324	7882	2902	14053	20465	11313	2699	3610	5840	4013
2000	15795	5522	8805	7863	3042	15050	21042	12164	2620	3929	5894	3845
2001	16160	6070	8852	8558	2861	15094	21049	11588	2495	4173	6135	3853
2002	17391	6194	9129	8615	3216	15257	22413	12111	3178	4613	5501	4384
2003	16060	6870	9205	8738	3482	13057	25256	13497	3611	4052	4551	4592
2004	20465	7279	10006	10127	4199	17345	27918	15425	4597	4671	4156	5295
2005	23150	7849	10979	10821	4942	17958	29170	17377	5491	4907	4208	6169
2006	26498	8766	11649	12159	4933	17399	29972	19531	5376	5784	4662	7002
2007	25779	8664	12053	11656	4284	15993	30107	19741	4661	6857	4512	7027

DL Distribution By Course Type

	Business	History	Math	Nat Sci	Phy Sci	Info Tech	Hummanit	English	No Cat	Medical	Techincal	Law
1995	5	1	3	7	1	2	15	3	2	3	1	1
1996	5	6	8	10	1	8	14	12	2	0	2	1
1997	165	89	74	136	13	85	258	206	61	44	39	11
1998	461	221	191	345	37	442	820	513	224	81	139	51
1999	875	306	269	474	52	927	1317	795	254	159	168	136
2000	1303	452	419	728	141	1382	1767	1103	271	205	198	247
2001	2302	749	662	1237	196	1859	2527	1319	412	379	327	369
2002	3750	1096	1035	1635	327	3310	4248	1955	726	771	351	818
2003	5016	1930	1682	2192	562	3966	7660	3232	977	1148	531	1319
2004	7537	2691	2627	3149	751	9358	10734	4817	1328	1707	625	1998
2005	9454	3650	3621	4150	958	10807	12927	7120	1628	2033	806	3100
2006	12625	5078	4498	5953	1344	10961	15116	9709	1898	2730	1110	4140
2007	14007	5541	5471	6662	1301	10216	17421	10710	1841	3521	1195	4495

Traditional Distribution By Course Type

	Business	History	Math	Nat Sci	Phy Sci	Info Tech	Hummanit	English	No Cat	Medical	Techincal	Law
1995	14204	6746	9625	8291	3168	11543	21191	11936	3222	2869	5406	4567
1996	11870	6012	8243	7261	2750	10465	18675	10567	2782	2804	4644	3987
1997	12286	5922	8192	7513	2710	10894	18947	11055	2689	3032	5154	4003
1998	13609	5720	8148	7816	3032	12331	19445	10693	2709	3124	5918	4293
1999	13864	5095	8055	7408	2850	13126	19148	10518	2445	3451	5672	3877
2000	14492	5070	8386	7135	2901	13668	19275	11061	2349	3724	5696	3598
2001	13858	5321	8190	7321	2665	13235	18522	10269	2083	3794	5808	3484
2002	13641	5098	8094	6980	2889	11947	18165	10156	2452	3842	5150	3566
2003	11044	4940	7523	6546	2920	9091	17596	10265	2634	2904	4020	3273
2004	12928	4588	7379	6978	3448	7987	17184	10608	3269	2964	3531	3297
2005	13696	4199	7358	6671	3984	7151	16243	10257	3863	2874	3402	3069
2006	13873	3688	7151	6206	3589	6438	14856	9822	3478	3054	3552	2862
2007	11772	3123	6582	4994	2983	5777	12686	9031	2820	3336	3317	2532

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX J. TA PASSING RATES BY COURSE TYPE

Overall TA Passing Rates by Course Type

	Business	History	Math	Nat Sci	Phy Sci	Info Tech	Hummanit	English	No Cat	Medical	Techincal	Law
1995	94.56%	91.59%	86.56%	88.84%	88.27%	92.70%	92.35%	91.43%	92.79%	92.34%	95.50%	94.90%
1996	94.86%	91.92%	86.01%	88.70%	87.70%	92.62%	91.78%	91.23%	92.67%	93.24%	94.83%	94.91%
1997	94.82%	90.32%	86.79%	89.31%	90.49%	93.02%	91.78%	91.47%	93.67%	94.24%	94.48%	95.36%
1998	95.23%	91.31%	88.32%	90.46%	89.62%	93.53%	93.11%	91.85%	94.35%	94.21%	95.11%	95.64%
1999	94.79%	89.73%	88.04%	89.92%	88.09%	93.31%	91.61%	91.41%	93.87%	93.13%	94.83%	95.05%
2000	94.57%	88.52%	86.76%	89.45%	89.61%	92.73%	91.01%	91.07%	94.48%	92.98%	95.04%	94.59%
2001	94.08%	88.67%	87.41%	90.22%	88.03%	92.25%	90.77%	90.42%	91.84%	93.48%	94.88%	93.71%
2002	93.36%	87.61%	85.68%	88.62%	87.31%	92.18%	90.13%	88.47%	91.93%	92.99%	94.36%	94.02%
2003	91.26%	85.51%	84.91%	87.52%	85.30%	89.27%	88.30%	87.29%	89.72%	90.30%	93.75%	91.76%
2004	90.88%	84.12%	84.74%	86.52%	84.85%	87.97%	87.43%	87.38%	89.31%	90.08%	92.56%	91.12%
2005	90.65%	85.58%	85.42%	87.99%	85.98%	87.75%	87.67%	87.06%	90.53%	90.22%	91.96%	89.99%
2006	91.07%	86.85%	84.88%	87.93%	85.15%	87.56%	88.25%	86.10%	91.07%	90.05%	91.70%	89.43%
2007	91.09%	87.05%	85.27%	87.87%	85.42%	87.85%	88.44%	86.97%	91.33%	90.42%	94.28%	90.78%
2008	92.36%	86.93%	87.04%	88.50%	88.85%	89.65%	89.43%	89.74%	90.48%	91.76%	94.71%	92.72%

DL TA Passing Rates by Course Type

	Business	History	Math	Nat Sci	Phy Sci	Info Tech	Hummanit	English	No Cat	Medical	Techincal	Law
1995	60.00%	100.00%	66.67%	100.00%	100.00%	100.00%	78.57%	0.00%	50.00%	33.33%	100.00%	100.00%
1996	100.00%	83.33%	75.00%	66.67%	100.00%	87.50%	85.71%	55.56%	100.00%		100.00%	
1997	82.72%	79.31%	80.00%	80.30%	83.33%	76.54%	84.40%	84.95%	89.47%	90.91%	81.58%	90.91%
1998	87.89%	78.95%	83.33%	85.89%	84.85%	85.58%	86.20%	83.80%	93.10%	90.91%	86.36%	86.27%
1999	86.59%	79.17%	83.33%	84.46%	82.00%	89.52%	84.48%	85.77%	92.50%	91.10%	89.80%	88.46%
2000	85.39%	73.79%	80.21%	79.03%	83.82%	84.77%	81.55%	83.68%	88.76%	87.50%	90.53%	86.70%
2001	87.11%	76.85%	80.00%	82.54%	80.33%	85.47%	84.28%	81.83%	82.61%	86.08%	86.69%	87.46%
2002	87.64%	77.75%	78.27%	80.75%	77.93%	87.02%	84.62%	79.34%	87.19%	90.79%	86.94%	86.35%
2003	87.20%	77.72%	78.78%	80.24%	75.52%	84.46%	84.63%	80.59%	84.31%	86.59%	85.88%	87.06%
2004	87.40%	77.44%	79.78%	81.30%	75.18%	85.64%	84.30%	82.04%	84.98%	87.68%	82.71%	86.05%
2005	86.99%	80.41%	81.45%	84.72%	76.88%	85.66%	85.14%	83.63%	87.47%	88.85%	85.01%	86.76%
2006	88.49%	85.17%	79.50%	85.67%	78.74%	85.84%	86.14%	82.87%	87.86%	89.22%	87.65%	87.02%
2007	88.98%	85.17%	82.17%	86.36%	78.79%	85.70%	86.80%	84.00%	88.28%	90.30%	91.19%	89.02%
2008	90.59%	84.80%	83.91%	86.53%	84.67%	88.39%	87.75%	87.18%	88.82%	91.19%	92.15%	91.53%

Traditonal TA Passing Rates by Course Type

	Business	History	Math	Nat Sci	Phy Sci	Info Tech	Hummanit	English	No Cat	Medical	Techincal	Law
1995	94.58%	91.59%	86.57%	88.83%	88.26%	92.70%	92.36%	91.45%	92.81%	92.40%	95.50%	94.89%
1996	94.86%	91.93%	86.02%	88.73%	87.70%	92.63%	91.78%	91.26%	92.67%	93.24%	94.83%	94.91%
1997	94.98%	90.48%	86.85%	89.48%	90.52%	93.14%	91.88%	91.58%	93.76%	94.29%	94.57%	95.37%
1998	95.47%	91.78%	88.44%	90.66%	89.67%	93.81%	93.40%	92.21%	94.45%	94.29%	95.30%	95.75%
1999	95.28%	90.36%	88.19%	90.27%	88.21%	93.57%	92.10%	91.83%	94.02%	93.22%	94.96%	95.23%
2000	95.37%	89.81%	87.07%	90.51%	89.89%	93.51%	91.87%	91.79%	95.12%	93.27%	95.19%	95.11%
2001	95.21%	90.29%	88.00%	91.48%	88.58%	93.18%	91.63%	91.48%	93.64%	94.19%	95.32%	94.34%
2002	94.91%	89.70%	86.62%	90.46%	88.34%	93.61%	91.40%	90.20%	93.38%	93.43%	94.85%	95.74%
2003	93.18%	88.63%	86.38%	90.14%	87.91%	91.42%	89.96%	89.43%	92.44%	91.84%	94.78%	93.63%
2004	93.49%	88.27%	86.71%	89.25%	88.48%	90.91%	89.53%	89.96%	92.27%	91.62%	94.37%	94.29%
2005	94.17%	90.45%	87.61%	90.36%	89.70%	91.19%	89.89%	89.64%	92.90%	91.34%	93.68%	93.37%
2006	94.05%	89.40%	88.57%	90.39%	88.81%	90.71%	90.56%	89.46%	94.11%	90.93%	93.01%	93.02%
2007	94.19%	90.72%	88.03%	90.13%	89.56%	91.84%	90.86%	90.62%	94.70%	90.58%	95.45%	93.98%
2008	95.44%	92.03%	90.09%	91.96%	91.67%	92.39%	92.64%	93.04%	94.74%	92.68%	95.80%	95.35%

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX K. TA PARTICIPATION BY RACE

Active Duty Enlisted Race Composition

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
White	263288	244813	224974	207748	192703	189779	185997	188926	166072	184742	178569	167479	149765
Black	70750	68945	66202	63861	61886	62988	64748	67351	60575	66557	64148	61034	56266
Native	2021	2136	2476	3198	4059	5378	6435	7198	6326	9325	11355	13052	14799
Asian	14490	15140	15744	16289	16888	17645	18243	19033	17725	19605	19705	19295	18447
Hispanic	28415	28960	28567	28554	28318	29631	31689	34380	30932	31232	27349	31731	41183

Active Duty Enlisted Overall Participation By Race

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
White	21,832	20,272	20,427	19,027	17,589	17,323	16,939	17,506	22,230	25,229	26,960	27,326	25,731
Black	6,001	5,928	6,384	6,307	6,397	6,913	7,353	7,695	9,836	10,646	11,724	12,179	11,949
Native	141	134	171	180	240	308	394	492	653	898	1,096	1,268	1,479
Asian	1,322	1,391	1,528	1,587	1,720	1,848	1,927	2,000	2,550	2,899	3,160	3,288	3,216
Hispanic	2,742	2,804	3,025	2,911	2,959	3,231	3,361	3,864	4,854	5,366	5,360	5,383	5,384

Active Duty Enlisted DL Participation By Race

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
White	14	17	639	1,469	2,187	2,658	3,381	4,950	8,373	12,373	14,899	17,077	17,476
Black	1	8	120	331	572	854	1,179	1,766	3,114	4,419	6,044	7,211	7,656
Native	0	0	4	14	24	46	77	107	216	415	527	679	912
Asian	1	1	32	89	145	205	277	397	683	1,109	1,431	1,719	1,916
Hispanic	2	3	74	162	248	404	486	776	1,348	2,049	2,515	2,970	3,239

Active Duty Enlisted Traditional Participation By Race

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
White	21,823	20,261	20,094	18,285	16,486	15,882	15,060	14,349	15,963	15,488	14,869	13,422	11,312
Black	6,000	5,926	6,324	6,151	6,126	6,508	6,746	6,669	7,689	7,430	7,187	6,688	5,948
Native	141	134	168	173	224	283	343	418	496	573	676	734	747
Asian	1,321	1,390	1,505	1,548	1,650	1,751	1,786	1,793	2,107	2,092	2,050	1,968	1,697
Hispanic	2,740	2,803	2,983	2,830	2,834	3,035	3,115	3,401	3,911	3,870	3,444	3,144	2,879

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX L. FULL SAMPLE REENLISTMENT MODEL RESULTS, OVERALL TA

Dependent variable: Reenlist2 and Reenlist (all 4 year contracts)				
	Reenlist2		Reenlist	
	Coefficent (standard error)	Marginal Effect	Coefficent (standard error)	Marginal Effect
pass_some	0.121	0.040	0.421	0.164
	(0.009)***		(0.008)***	
female	-0.167	-0.052	-0.134	-0.053
	(0.007)***		(0.006)***	
black	0.188	0.063	0.136	0.054
	(0.007)***		(0.006)***	
native	0.002	0.001	-0.037	-0.015
	(0.016)		(0.013)***	
asian	0.410	0.146	0.434	0.169
	(0.012)***		(0.011)***	
hispanic	0.113	0.037	0.127	0.051
	(0.009)***		(0.008)***	
other	0.130	0.044	0.235	0.093
	(0.036)***		(0.029)***	
married	0.310	0.104	0.370	0.146
	(0.008)***		(0.007)***	
depend2	0.160	0.052	0.156	0.062
	(0.004)***		(0.004)***	
age	-0.001	-0.000	-0.002	-0.001
	(0.001)		(0.001)*	
afqt	-0.002	-0.001	0.003	0.001
	(0.000)***		(0.000)***	
non_hs_dip	-0.140	-0.043	-0.246	-0.097
	(0.011)***		(0.010)***	
ged	-0.234	-0.070	-0.318	-0.125
	(0.015)***		(0.013)***	
some_col	-0.182	-0.055	-0.165	-0.065
	(0.014)***		(0.012)***	
fy95	0.022	0.007	0.022	0.009
	(0.012)*		(0.012)*	
fy96	0.179	0.060	0.127	0.051
	(0.012)***		(0.011)***	
fy97	0.339	0.117	0.254	0.101
	(0.012)***		(0.011)***	
fy98	0.409	0.143	0.398	0.156
	(0.012)***		(0.011)***	
fy99	0.284	0.097	0.385	0.151
	(0.012)***		(0.011)***	
fy00	0.058	0.019	0.370	0.145
	(0.012)***		(0.011)***	
fy01	-0.225	-0.069	0.305	0.120
	(0.012)***		(0.011)***	
fy02			0.372	0.146
			(0.011)***	

Dependent variable: Reenlist2 and Reenlist (all 4 year contracts)				
	Reenlist2		Reenlist	
	Coefficent (standard error)	Marginal Effect	Coefficent (standard error)	Marginal Effect
fy03			0.377	0.148
			(0.012)***	
Constant	-1.128		-1.149	
	(0.025)***		(0.022)***	
Observations	276242	276242	349847	349847
Standard errors in parentheses				
* significant at 10%; ** significant at 5%; *** significant at 1%				

APPENDIX M. FULL SAMPLE REENLISTMENT MODEL RESULTS BY METHOD OF INSTRUCTION

Dependent variable: Reenlist2 (Full Sample)				
	Overall TA		DL and Traditional TA	
	Coefficent (standard error)	Marginal Effect	Coefficent (standard error)	Marginal Effect
pass_some	-0.065	-0.024		
	(0.009)***	(0.004)***		
dl_some			-0.125	-0.046
			(0.023)***	
nondl_some			-0.053	-0.020
			(0.010)***	
female	-0.108	-0.040	-0.107	-0.040
	(0.008)***		(0.008)***	
black	0.227	0.088	0.227	0.088
	(0.008)***		(0.008)***	
native	0.027	0.010	0.027	0.010
	(0.018)		(0.018)	
asian	0.324	0.127	0.323	0.126
	(0.013)***		(0.013)***	
hispanic	0.075	0.028	0.074	0.028
	(0.009)***		(0.009)***	
other	0.109	0.042	0.109	0.042
	(0.040)***		(0.040)***	
married	0.196	0.075	0.197	0.075
	(0.009)***		(0.009)***	
depend2	0.133	0.050	0.133	0.050
	(0.005)***		(0.005)***	
age	0.008	0.003	0.008	0.003
	(0.001)***		(0.001)***	
afqt	-0.002	-0.001	-0.002	-0.001
	(0.000)***		(0.000)***	
non_hs_dip	-0.009	-0.004	-0.010	-0.004
	(0.013)		(0.013)	
ged	-0.071	-0.027	-0.071	-0.027
	(0.018)***		(0.018)***	
some_col	-0.128	-0.047	-0.128	-0.047
	(0.016)***		(0.016)***	
fy95	0.060	0.023	0.061	0.023
	(0.013)***		(0.013)***	
fy96	0.208	0.080	0.209	0.081
	(0.013)***		(0.013)***	
fy97	0.367	0.143	0.368	0.144
	(0.013)***		(0.013)***	
fy98	0.423	0.165	0.425	0.166
	(0.013)***		(0.013)***	
fy99	0.291	0.113	0.294	0.114
	(0.013)***		(0.013)***	
fy00	0.017	0.006	0.020	0.007
	(0.013)		(0.013)	

Dependent variable: Reenlist2 (Full Sample)				
	Overall TA		DL and Traditional TA	
	Coefficent (standard error)	Marginal Effect	Coefficent (standard error)	Marginal Effect
fy01	-0.285	-0.104	-0.282	-0.102
	(0.013)***		(0.013)***	
Constant	-0.810		-0.814	
	(0.028)***		(0.028)***	
Observations	200288	200288	200288	200288
Standard errors in parentheses				
* significant at 10%; ** significant at 5%; *** significant at 1%				

APPENDIX N. FULL SAMPLE REENLISTMENT & EXTENSIONS MODEL RESULTS, BY METHOD OF INSTRUCTION

Dependent variable: Reenlist(Full sample)				
	Overall TA		DL and Traditional TA	
	Coefficent (standard error)	Marginal Effect	Coefficent (standard error)	Marginal Effect
pass_some	0.077	0.026		
	(0.009)***	(0.003)***		
dl_some			0.027	0.009
			(0.018)	(0.006)
nondl_some			0.080	0.027
			(0.009)***	(0.003)***
female	-0.027	-0.009	-0.027	-0.009
	(0.008)***	(0.003)***	(0.008)***	(0.003)***
black	0.208	0.068	0.208	0.068
	(0.008)***	(0.002)***	(0.008)***	(0.002)***
native	-0.014	-0.005	-0.014	-0.005
	(0.016)	(0.006)	(0.016)	(0.006)
asian	0.338	0.105	0.338	0.105
	(0.013)***	(0.004)***	(0.013)***	(0.004)***
hispanic	0.081	0.027	0.081	0.027
	(0.009)***	(0.003)***	(0.009)***	(0.003)***
other	0.190	0.062	0.190	0.061
	(0.035)***	(0.010)***	(0.035)***	(0.010)***
married	0.196	0.066	0.196	0.066
	(0.008)***	(0.003)***	(0.008)***	(0.003)***
depend2	0.119	0.041	0.119	0.041
	(0.004)***	(0.002)***	(0.004)***	(0.002)***
age	0.013	0.005	0.013	0.005
	(0.001)***	(0.000)***	(0.001)***	(0.000)***
afqt	0.006	0.002	0.006	0.002
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
non_hs_dip	-0.086	-0.030	-0.086	-0.030
	(0.012)***	(0.004)***	(0.012)***	(0.004)***
ged	-0.099	-0.035	-0.099	-0.035
	(0.016)***	(0.006)***	(0.016)***	(0.006)***
some_col	-0.081	-0.028	-0.081	-0.028
	(0.014)***	(0.005)***	(0.014)***	(0.005)***
fy95	0.089	0.030	0.089	0.030
	(0.014)***	(0.004)***	(0.014)***	(0.004)***
fy96	0.165	0.054	0.165	0.054
	(0.013)***	(0.004)***	(0.013)***	(0.004)***
fy97	0.289	0.092	0.289	0.092
	(0.013)***	(0.004)***	(0.013)***	(0.004)***
fy98	0.455	0.138	0.455	0.138
	(0.013)***	(0.004)***	(0.013)***	(0.004)***
fy99	0.471	0.143	0.471	0.143
	(0.013)***	(0.003)***	(0.013)***	(0.003)***
fy00	0.420	0.130	0.421	0.130
	(0.013)***	(0.004)***	(0.013)***	(0.004)***

Dependent variable: Reenlist(Full sample)				
	Overall TA		DL and Traditional TA	
	Coefficent (standard error)	Marginal Effect	Coefficent (standard error)	Marginal Effect
fy01	0.340	0.107	0.341	0.107
	(0.013)***	(0.004)***	(0.013)***	(0.004)***
fy02	0.461	0.140	0.463	0.140
	(0.013)***	(0.003)***	(0.013)***	(0.004)***
fy03	0.380	0.118	0.382	0.119
	(0.013)***	(0.004)***	(0.013)***	(0.004)***
Constant	-0.956		-0.957	
	(0.027)***		(0.027)***	
Observations	255749	255749	255749	255749
Standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%				

APPENDIX O. FULL SAMPLE PROMOTE TO E4 MODEL RESULTS, BY METHOD OF INSTRUCTION

Dependent variable: Promote to E4 (full sample)				
	Overall TA		DL and Traditional TA	
	Coefficent (standard error)	Marginal Effect	Coefficent (standard error)	Marginal Effect
pass_some	0.422	0.062		
	(0.013)***	(0.001)***		
dl_some			0.412	0.057
			(0.029)***	
nondl_some			0.387	0.057
			(0.013)***	
female	-0.221	-0.043	-0.223	-0.044
	(0.009)***		(0.009)***	
black	-0.217	-0.042	-0.217	-0.042
	(0.009)***		(0.009)***	
native	-0.059	-0.011	-0.059	-0.011
	(0.022)***		(0.022)***	
asian	0.211	0.033	0.212	0.034
	(0.018)***		(0.018)***	
hispanic	0.013	0.002	0.013	0.002
	(0.012)		(0.012)	
other	0.083	0.014	0.083	0.014
	(0.045)*		(0.045)*	
married	0.148	0.026	0.148	0.026
	(0.011)***		(0.011)***	
depend2	0.025	0.004	0.025	0.004
	(0.006)***		(0.006)***	
age	0.021	0.004	0.021	0.004
	(0.002)***		(0.002)***	
afqt	0.012	0.002	0.012	0.002
	(0.000)***		(0.000)***	
non_hs_dip	-0.228	-0.046	-0.227	-0.046
	(0.015)***		(0.015)***	
ged	-0.311	-0.066	-0.311	-0.066
	(0.021)***		(0.021)***	
some_col	-0.038	-0.007	-0.038	-0.007
	(0.020)*		(0.020)*	
fy95	0.118	0.020	0.118	0.020
	(0.017)***		(0.017)***	
fy96	0.360	0.053	0.358	0.053
	(0.018)***		(0.018)***	
fy97	0.443	0.063	0.440	0.062
	(0.017)***		(0.017)***	
fy98	0.514	0.071	0.512	0.070
	(0.017)***		(0.017)***	
fy99	0.426	0.062	0.422	0.061
	(0.017)***		(0.017)***	
fy00	0.391	0.058	0.387	0.057
	(0.017)***		(0.017)***	

Dependent variable: Promote to E4 (full sample)				
	Overall TA		DL and Traditional TA	
	Coefficent (standard error)	Marginal Effect	Coefficent (standard error)	Marginal Effect
fy01	0.311 (0.017)***	0.047	0.307 (0.017)***	0.047
fy02	0.241 (0.016)***	0.038	0.236 (0.017)***	0.037
fy03	0.162 (0.017)***	0.027	0.155 (0.017)***	0.026
Constant	-0.577 (0.036)***		-0.572 (0.036)***	
Observations	215410	215410	215410	215410
Standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%				

APPENDIX P. FULL SAMPLE PROMOTE TO E5 MODEL RESULTS, BY METHOD OF INSTRUCTION

Dependent variable: Promote to E5 (full sample)				
	Overall TA		DL and Traditional TA	
	Coefficent (standard error)	Marginal Effect	Coefficent (standard error)	Marginal Effect
pass_some	0.267	0.075		
	(0.013)***			
dl_some			0.287	0.083
			(0.023)***	
nondl_some			0.224	0.062
			(0.014)***	
female	-0.170	-0.041	-0.173	-0.042
	(0.012)***		(0.012)***	
black	-0.220	-0.053	-0.220	-0.053
	(0.014)***		(0.014)***	
native	-0.067	-0.017	-0.066	-0.017
	(0.024)***		(0.024)***	
asian	0.010	0.002	0.011	0.003
	(0.020)		(0.020)	
hispanic	-0.078	-0.019	-0.078	-0.019
	(0.014)***		(0.014)***	
other	-0.103	-0.025	-0.105	-0.026
	(0.053)*		(0.053)**	
married	0.035	0.009	0.034	0.009
	(0.013)***		(0.013)***	
depend2	0.036	0.009	0.035	0.009
	(0.007)***		(0.007)***	
age	0.041	0.010	0.041	0.010
	(0.002)***		(0.002)***	
afqt	0.021	0.005	0.021	0.005
	(0.000)***		(0.000)***	
non_hs_dip	-0.183	-0.043	-0.182	-0.043
	(0.022)***		(0.022)***	
ged	-0.166	-0.039	-0.165	-0.039
	(0.027)***		(0.027)***	
some_col	0.227	0.064	0.227	0.064
	(0.020)***		(0.020)***	
fy95	0.174	0.048	0.173	0.048
	(0.024)***		(0.024)***	
fy96	0.318	0.092	0.316	0.091
	(0.024)***		(0.024)***	
fy97	0.510	0.155	0.507	0.154
	(0.023)***		(0.023)***	
fy98	0.824	0.268	0.819	0.266
	(0.023)***		(0.023)***	
fy99	0.957	0.316	0.952	0.314
	(0.022)***		(0.022)***	
fy00	0.907	0.297	0.901	0.295
	(0.022)***		(0.022)***	

Dependent variable: Promote to E5 (full sample)				
	Overall TA		DL and Traditional TA	
	Coefficent (standard error)	Marginal Effect	Coefficent (standard error)	Marginal Effect
fy01	0.814 (0.022)***	0.264	0.807 (0.022)***	0.262
fy02	0.720 (0.022)***	0.229	0.711 (0.022)***	0.226
fy03	0.674 (0.023)***	0.214	0.664 (0.023)***	0.210
Constant	-3.872 (0.042)***		-3.860 (0.042)***	
Observations	138679	138679	138679	138679
Standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%				

APPENDIX Q. INDIVIDUAL FIXED EFFECTS MODEL RESULTS

Dependent variable: Passed course	
Explanatory Variable	Coefficent (standard error)
	Enlisted Undergraduate
dumdl	-0.075
	(0.002)***
fy1996	-0.012
	(0.001)***
fy1997	-0.013
	(0.002)***
fy1998	-0.010
	(0.002)***
fy1999	-0.017
	(0.002)***
fy2000	-0.013
	(0.002)***
fy2001	-0.014
	(0.002)***
fy2002	-0.012
	(0.002)***
fy2003	-0.002
	(0.002)
fy2004	-0.001
	(0.002)
fy2005	-0.001
	(0.002)
fy2006	-0.001
	(0.002)
fy2007	0.001
	(0.002)
fy2008	0.003
	(0.003)
business	-0.007
	(0.001)***
dl_business	0.005
	(0.002)***
history	-0.011
	(0.001)***
dl_history	-0.027
	(0.002)***
math	-0.049
	(0.001)***
dl_math	-0.012
	(0.002)***
natscience	-0.022
	(0.001)***
dl_natscience	-0.004
	(0.002)*
physcience	-0.050
	(0.002)***
dl_physcience	-0.013
	(0.004)***
infotech	-0.005
	(0.001)***
dl_infotech	0.010
	(0.002)***
english	-0.006

Dependent variable: Passed course	
Explanatory Variable	Coefficent (standard error)
	(0.001)***
dl_english	-0.015
	(0.002)***
misc	-0.006
	(0.002)***
dl_misc	0.004
	(0.003)
medical	0.003
	(0.002)
dl_medical	0.002
	(0.003)
technical	0.002
	(0.001)
dl_technical	0.001
	(0.004)
nonrate	-0.026
	(0.002)***
dl_nonrate	-0.012
	(0.003)***
e4	-0.010
	(0.001)***
dl_e4	-0.012
	(0.002)***
e6	-0.000
	(0.001)
dl_e6	0.006
	(0.002)***
e7	-0.001
	(0.002)
dl_e7	0.023
	(0.002)***
e8	0.002
	(0.004)
dl_e8	0.030
	(0.004)***
e9	0.004
	(0.007)
dl_e9	0.028
	(0.007)***
Constant	0.943
	(0.002)***
Observations	1526036
Number of individuals	233459
R-squared	0.01

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

APPENDIX R. DL-USERS ONLY REENLISTMENT MODELS RESULTS

Dependent variables: *Reenlist2, Reenlist*				
	DL on Reenlist2 w/ All TA-users		DL on Reenlist w/ All TA-users	
	Coefficent (standard error)	Marginal Effect	Coefficent (standard error)	Marginal Effect
dl_some	-0.035	-0.013	0.077	0.026
	(0.024)		(0.019)***	
female	0.002	0.001	-0.031	-0.011
	(0.016)		(0.014)**	
black	0.195	0.071	0.184	0.061
	(0.020)***		(0.018)***	
native	0.085	0.031	0.017	0.006
	(0.049)*	(0.018)*	(0.041)	
asian	0.235	0.088	0.220	0.072
	(0.029)***		(0.029)***	
hispanic	0.101	0.037	0.101	0.034
	(0.022)***		(0.020)***	
unknown	-0.204	-0.069	-0.031	-0.011
	(0.138)		(0.074)	
other	0.057	0.021	0.061	0.021
	(0.084)		(0.071)	
married	0.114	0.041	0.178	0.061
	(0.019)***		(0.018)***	
depend2	0.146	0.052	0.115	0.039
	(0.011)***		(0.010)***	
age	0.007	0.002	0.001	0.000
	(0.003)**		(0.003)	
afqt	-0.002	-0.001	0.005	0.002
	(0.000)***		(0.000)***	
non_hs_dip	-0.012	-0.004	-0.077	-0.027
	(0.037)		(0.034)**	
ged	0.019	0.007	-0.096	-0.034
	(0.049)		(0.043)**	
some_col	-0.111	-0.039	-0.080	-0.028
	(0.038)***		(0.033)**	
fy95	0.040	0.014	0.124	0.042
	(0.029)		(0.029)***	
fy96	0.201	0.074	0.238	0.077
	(0.030)***		(0.030)***	
fy97	0.398	0.150	0.486	0.146
	(0.031)***		(0.032)***	
fy98	0.372	0.140	0.591	0.173
	(0.029)***		(0.030)***	
fy99	0.220	0.081	0.701	0.197
	(0.030)***		(0.031)***	
fy00	0.016	0.006	0.676	0.193
	(0.030)		(0.030)***	
fy01	-0.320	-0.107	0.525	0.157

Dependent variables: *Reenlist2, Reenlist*				
	DL on Reenlist2 w/ All TA-users		DL on Reenlist w/ All TA-users	
	Coefficent (standard error)	Marginal Effect	Coefficent (standard error)	Marginal Effect
	(0.031)***		(0.030)***	
fy02			0.624	0.183
			(0.029)***	
fy03			0.551	0.165
			(0.029)***	
Constant	-0.870		-0.868	
	(0.067)***		(0.061)***	
Observations	34343	34343	45874	45874
Standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%				

APPENDIX S. DL-USERS ONLY PROMOTION MODEL RESULTS

	Dependent variable: Promote E4 & Promote E5			
	DL on Promote E4 w/ all TA-users		DL on Promote E5 w/ all TA-users	
	Coefficent (standard error)	Marginal Effect	Coefficent (standard error)	Marginal Effect
dl_some	0.359 (0.029)***	0.061	0.215 (0.026)***	0.057
female	-0.188 (0.018)***	-0.038	-0.115 (0.022)***	-0.028
black	-0.167 (0.022)***	-0.035	-0.127 (0.030)***	-0.030
native	0.002 (0.058)	0.000	-0.094 (0.059)	-0.022
asian	0.176 (0.036)***	0.032	-0.020 (0.046)	-0.005
hispanic	0.035 (0.026)	0.007	-0.047 (0.032)	-0.011
unknown	-0.002 (0.093)	-0.000	-0.091 (0.114)	-0.021
other	0.080 (0.092)	0.015	-0.132 (0.114)	-0.030
married	0.139 (0.022)***	0.027	0.018 (0.028)	0.004
depend2	0.043 (0.013)***	0.008	0.041 (0.015)***	0.010
age	0.012 (0.003)***	0.002	0.028 (0.004)***	0.007
afqt	0.016 (0.001)***	0.003	0.020 (0.001)***	0.005
non_hs_dip	-0.213 (0.042)***	-0.047	-0.157 (0.056)***	-0.036
ged	-0.302 (0.055)***	-0.070	-0.172 (0.067)***	-0.039
some_col	-0.001 (0.045)	-0.000	0.143 (0.046)***	0.037
fy95	0.126 (0.033)***	0.023	0.140 (0.055)**	0.036
fy96	0.362 (0.036)***	0.059	0.335 (0.056)***	0.094
fy97	0.686 (0.041)***	0.094	0.581 (0.056)***	0.175
fy98	0.725 (0.038)***	0.099	0.815 (0.052)***	0.258
fy99	0.643 (0.038)***	0.091	0.905 (0.052)***	0.292
fy00	0.579 (0.037)***	0.085	0.907 (0.052)***	0.292
fy01	0.482 (0.036)***	0.075	0.838 (0.052)***	0.266

Dependent variable: Promote E4 & Promote E5				
	DL on Promote E4 w/ all TA-users		DL on Promote E5 w/ all TA-users	
	Coefficent (standard error)	Marginal Effect	Coefficent (standard error)	Marginal Effect
fy02	0.428	0.069	0.730	0.224
	(0.035)***		(0.051)***	
fy03	0.333	0.056	0.637	0.192
	(0.035)***		(0.052)***	
Constant	-0.819		-3.400	
	(0.079)***		(0.098)***	
Observations	38912	38912	24782	24782
Standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%				

LIST OF REFERENCES

Acemoglu, D., & Pischke, J. (1999). Beyond Becker: Training in Imperfect Labour Markets. *The Economic Journal*, 109(2), F112-F142.

Allen, E., & Seaman, J. (2007). Online Nation, Five Years of Growth in Online Learning. *The Sloan Consortium.*

Allen, M., Bourhis, J., Burrell, N., & Mabry, E. (2002). Comparing Student Satisfaction With Distance Education to Traditional Classrooms in Higher Education: A Meta-Analysis. *The American Journal of Distance Education,* 16(2) 83-97

Autor, D. 2001. Why do Temporary Help Firms Provide General Skills Training? *Quarterly Journal of Economics*, 116(4), 1,409-1,448.

Beffa-Negrini, P., Miller, B., & Cohen, N. (2002). Factors Related to Success and Satisfaction in Online Learning, *Academic Exchange*, Fall, 105-114.

Borstorff, P., & Lowe, S. (2007). Student Perceptions and Opinions Toward E-Learning in the College Environmnet. *Academy of Educational Leadership Journal*, 11(2).

Brigham, D. (2003). Benchmark Information Survey. Unpublished presentation, Excelsior University.

Bureau of Labor Statistics (2007). The National Compensation Survey: Employee Benefits in Private Industry in the U.S.

Capelli, P. 2004. Why do employers pay for college? Journal of Econometrics, 121, 2, 113-2,241.

Capelli, P., (2004). Why Do Employers Pay for College? Journal of Econometrics, 121: 213-241.

Card, D. (1993). Using Geographic Variation in College Proximity to Estimate the Return to Schooling. Princeton University: Industrial Relations section, Working Paper No. 317

Carr, S. (2000). As Distance Education Comes of Age, the Challenge is Keeping the Students. *Chronicle of Higher Education*, v46 n23 pA39-A41.

Dutton, J., Dutton, M., & Perry, J. (2002). How do Online Students Differ from Lecture Students? *Journal of Asynchronous Learning Networks*, 6(1), 1-20.

Ehrenberg, R. G. & Smith, R.S. (2008). Modern Labor Economics 10th Ed. Pearson Addison Wesley.

Flaherty, C. (2007). The Effect of Tuition Reimbursement on Turnover: A Case Study Analysis. Working Paper 12975. Cambridge, MA: National Bureau of Economics Research.

Garcia, F. & Joy, E. (1998). Effectiveness of the Voluntary Education Program. Alexandria, VA: Center for Naval Analyses.

Garcia, F., Arkes, J., & Trost, T. (2002). Does employer-financed general training pay? Evidence from the U.S. Navy. *Economics of Education Review*, 21, 19-27.

Glick, H. A., & Feuer, M. J. (1984). Employer-sponsored training and the governance of specific human capital investments, *Quarterly Review of Economics and Business*, 24(2), 91-103.

Howell, S., Laws, D., Lindsay, N. (2004). Reevaluating Course Completion in Distance Education, Avoiding the Comparison Between Apples and Oranges. *The Quarterly Review of Distance Education*, 5(4), 243-252.

Kemp, W. (2002). Persistence of Adult Learners in Distance Education. *The American Journal of Distance Education,* 16(2) 65-81.

Mehay, S., & Pema, E. (2009). The Effect of Employer-Sponsored General Education on Turnover and Productivity: New Evidence from Military Tuition Assistance Programs. Monterey, CA: Naval Postgraduate School, Graduate School of Business and Public Policy.

Navy College Progam," Mission Statement, ed. VOLED Detachment, Center for Personal and Professional Development, https://www.navycollege.navy.mil/about.htm.

Phipps, R., & Merisotis, J. (1999). What’s the Difference, A review of Contemporary Research on the Effectiveness of Distance Learning in Higher Education. *The Institute for Higher Education Policy.*

Voluntary Education Fact Sheet, ed. Defense Activity for NonTraditional Education Support, 2006, <http://www.dantes.doded.mil/Dantes_Web/library/docs/voledfacts/FY06.pdf.

THIS PAGE INTENTIONALLY LEFT BLANK

INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center
   Ft. Belvoir, Virginia

2. Dudley Knox Library
   Naval Postgraduate School
   Monterey, California

3. Dr. Stephen Mehay
   Naval Postgraduate School, GSBPP
   Monterey, California

4. Dr. Elda Pema
   Naval Postgraduate School, GSBPP
   Monterey, California

5. Ann Hunter
   N15
   Washington, District of Columbia